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'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

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Locke's Thoughts Concerning Education.

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III.

ESSAY ON GOOD MANNERS—*Continued.*

Breeding.—*(a) Excess of ceremony is mistaken civility.* **Par. 144.**

There is another fault in good manners, and that is, *excess of ceremony*, and an obstinate persisting to force upon another what is not his due, and what he cannot take without folly or shame. This seems rather a design to expose than oblige or at least looks like a contest for mastery, and at best is but troublesome; and so can be no part of good breeding, which has no other use or end, but to make people easy and satisfied in their conversation with us. This is a fault few young people are apt to fall into; but yet if they are ever guilty of it, or are suspected to incline that way, they should be told of it, and warned of this *mistaken civility*. The thing they should endeavour and aim at in conversation, should be, to show Respect, Esteem, and Good-will, by paying to every one that common ceremony and regard which is in civility due to them. To do this, without a suspicion of flattery, dissimulation, or meanness, is a great skill, which good sense, reason, and good company, can only teach; but is of so much use in civil life, that it is well worth the studying.

(b) Rules of conduct are of little value: **'as is his company such will be his manners.' Par. 145.**

Though the managing ourselves well in this part of our behaviour has the name of good breeding, as if peculiarly the effect of education; yet, as I have said, young children should not be much perplexed about it; I mean, about putting off their hats and making legs modishly*. Teach them humility, and to be good-natured, if you can, and this sort of manners will not be wanting; civility being, in truth, nothing but a care not to show any slighting, or contempt of any one in conversation. What are the most allowed and esteemed ways of expressing this, we have above observed. It (*i.e.*, civility and good manners) is as peculiar and different, in several countries* of the world, as their languages; and therefore, if it be rightly considered, rules and discourses made to children about it, are as useless and impertinent, as it would be now and then to give a rule or two of the Spanish tongue to one that converses only with Englishmen. Be as busy as you please with discourses of civility to your son, still, such as is his company, such will be his manners. A plough-man of your neighbourhood, that has never been out of his parish, read what lectures you please to him, will be as soon in his language as his carriage, a courtier; that is, in neither will be more polite than those he uses to converse with: and therefore, of this no other care can be taken till he be of an age to have a tutor put to him, who must not fail to be a well-bred man. And, in good earnest, if I were to speak my mind freely, so long as children do nothing out of obstinacy, pride, and ill-nature, 'tis no great matter how they put off their hats, or make legs. If you can teach them to love and respect other people, they will, as their age requires it, find ways to express it acceptably to every one, according to the fashions they have been used to.

[It should be remembered that the advice here given is for the training of those who, *for the most part*, will spend their lives in the best and most refined society. The question is altogether changed where the training of children in our elementary schools is concerned. In many cases these grow up with few or none of the moral influences of a good home training. For them, a few rules of conduct taught in their early years and applied as far as convenient in reference to their behaviour towards their fellow-scholars and their teachers may be of great value, and in fact may be the only discipline in good conduct they receive before taking their places amongst the great working community of our land. To give our children intellectual sharpness in our schools and to leave to the workshop and the factory the development of character so far as consideration for, and right behaviour towards others is concerned, would be a mistake and would soon manifest itself in the development of a harsh and selfish condition of national life.]

(c) As to the motions and carriage of their bodies.

A dancing-master, as has been said, when it is fit, will teach them what is most becoming. In the meantime, when they are young, people expect not their children should be over-mindful of these ceremonies. Carelessness is allowed to that age, and becomes them as well as compliments do grown people: or, at least, if some very nice people will think it a fault, I am sure it is a fault that should be over-looked, and left to time, a tutor, and conversation to cure. And therefore I think it not worth your while to have your son (as I often see children are) molested or chid about it: but where there is *pride*, or *ill nature* appearing in his carriage, there he must be persuaded, or shamed out of it.

[In the phrase 'carelessness is allowed to that age,' Locke pleads for the child a natural condition which we are in some danger of suppressing. We may over-teach and over-control, and thus leave too little for the child mind to initiate and do. On the other hand careless habits either in conduct or work must not be allowed to establish themselves.]

(d) **Faults of breeding and how they should be corrected.**

1. Forwardness to interrupt.

Though children, when little, should not be much perplexed with rules and ceremonious parts of breeding, yet there is a sort of unmannerliness very apt to grow up with young people, if not early restrained; and that is a *forwardness to interrupt* others that are speaking, and to stop them with some contradiction. Whether the custom of disputing, and the reputation of parts* and learning usually given to it, as if it were the only standard and evidence of knowledge, make young men so forward to watch occasions to correct others in their discourse, and not to slip any opportunity of showing their talents: so it is, that I have found scholars most blamed in this point.

There cannot be a greater rudeness than to *interrupt* another in the current of his discourse; for if there be not impertinent folly in answering a man before we know what he will say, yet it is a plain declaration, that we are weary to hear him talk any longer, and have a dis-esteem of what he says; which we judging not fit to entertain the company, desire them to give audience to us, who have something to produce worth their attention. This shows a very great disrespect, and cannot but be offensive; and yet, this is what almost all interruption constantly carries with it. To which, if there be added, as is usual, a correcting of any mistake, or a contradiction of what has been said, it is a mark of yet greater pride and self-conceitedness, when we thus intrude ourselves for teachers, and take upon us, either to set another right in his story, or show the mistakes of his judgment.

2. Enquiry, and not instruction, to be encouraged on the part of the young.

I do not say this, that I think there should be no difference of opinions in conversation, nor opposition in men's discourses: this would be to take away the greatest advantage of society, and the improvements which are to be made by ingenious company; where the light is to be got from the opposite arguings of men of parts, showing the different sides of things, and their various aspects, and probabilities, would be quite lost, if every one were obliged to assent to, and say after* the first speaker. 'Tis not the owning one's dissent from another, that I speak against, *but the manner of doing it.* Young men should be taught not to be forward to interpose their opinions, unless asked, or when others have done, and are silent; and then only **by way of inquiry, not instruction.** The positive asserting, and the magisterial air should be avoided; and when a general pause of the whole company affords an opportunity, they may modestly put in their question as **learners.**

This becoming decency will not cloud their parts, nor weaken the strength of their reason; but bespeak the more favourable attention, and give what they say the greater advantage. An ill argument, or ordinary observation, thus introduced, with some civil preface of deference and respect to the opinions of others, will procure them more credit and esteem, than the sharpest wit or the profoundest science, with a rough, insolent, or noisy management, which always shocks the hearers, and leaves an ill opinion of the man, though he get the better of it in the argument.

3. Rudeness in dispute, with examples, one for **imitation** *and one* **not.**

This therefore should be carefully watched in young people, stopped in the beginning, and the contrary habit introduced in all their conversation. And the rather, because forwardness to talk, frequent interruptions in arguing, and *loud wrangling*, are too often observable amongst grown people even of rank amongst us.

Example 1. The Indians, whom we call barbarous, observe much more decency and civility in their discourses and conversation; giving one another a fair silent hearing, till they have quite done; and then answering them calmly, and without noise or passion. And if it be not so in this civilized part of the world, we must impute it to a neglect in education, which has not yet reformed this ancient piece of barbarity amongst us.

Example 2. Was it not, think you, an entertaining spectacle, to see two ladies of quality accidentally seated on the opposite sides of a room set round with company, fall into a dispute, and grow so eager in it, that in the heat of their controversy, edging by degrees their chairs forwards, they were in a little time got up close to one another in the middle of the room; where they for a good while managed the dispute as fiercely as two game-cocks in the pit, without minding or taking any notice of the circle, who could not all the while forbear smiling? This I was told by a person of quality, who was present at the combat, and did not omit to reflect upon the indecencies that warmth in dispute often runs people into; **which, since custom makes too frequent, education should take the more care of.**

There is nobody but condemns this in others, though they overlook it in themselves; and many who are sensible of it in themselves, and resolve against it, cannot yet get rid of an ill custom which neglect in their education has suffered to settle into a habit.

[The spirit of enquiry is one of the most valuable forms of intellectual activity that a teacher is permitted to cultivate in his class. On the formula 'Don't be tiresome and don't ask questions,' Dr. Fitch remarks: 'One might have hoped that this was one of the modes of treating

children which was becoming obsolete, and that the teachers of the future would at least try to regard the curious and inquiring spirit among the children, as one of the most hopeful of signs; one of the principal things to be encouraged in early training; one of their surest allies in the later development of thought. "For curiosity," Archbishop Whateley says, "is the parent of attention, and a teacher has no more right to expect success in teaching those who have no curiosity to learn than a husbandman who sows a field without ploughing it." I doubt whether any one of us can establish for himself a satisfactory code of laws, or a workable theory of discipline, until he shall at least have made up his mind on the point thus raised. Is the childish curiosity a thing to be repressed as an impertinence and a nuisance, or to be encouraged and welcomed as the teacher's best auxiliary? Is the habit of putting questions on what a child does not understand—of saying, when a hard word occurs, "If you please will you explain that to me, I want to know"—a good habit or a bad one? For my part, although I am quite aware that as a matter of discipline, mere impudence, and forwardness—the putting of questions for the sake of giving trouble to teachers—ought to be sternly discountenanced when they occur; it seems to me nevertheless true that for every time in which they occur, there are ten times in which the question of a child evinces real mental activity and a desire to know.']

(*e*) COMPANIONS, their influence greater than all a parent or teacher can do, and hence to be carefully provided for. Par. 146.

What has been above said concerning company, would perhaps, if it were well reflected on, give us a larger prospect, and let us see how much farther its influence reaches. 'Tis not the modes of civility* alone, that are imprinted by conversation. The tincture of company sinks deeper than the outside; and possibly, if a true estimate were made of the morality and religions of the world, we should find, that the far greater part of mankind received even those opinions and ceremonies they would die for, rather from the fashions of their countries, and the constant practice of those about them, than from any conviction of their reasons. I mention this only **to let you see of what moment I think company is to your son, in all the parts of his life; and therefore how much that one part is to be weighed, and provided for; it being of greater force to work upon him, than all you can do besides.**

[Being religious by imitation and not from conviction, is one of those irreverent expressions which Locke at times indulges in. He evidently uses, for the purposes of an illustration, a topic which he does not understand, and somewhat gratuitously goes out of his way to manifest his ignorance. The truth illustrated however we can all accept, for in our efforts at moral discipline we never forget the evil which may arise from allowing children to be associated in class work with the low and the vulgar. The greatest triumph which any teacher can hope for is effected when by skilful discipline and training he utilizes the example of the good for the benefit of the bad without the former being in the least contaminated by the latter.]

Glossary.

Making legs modishly = moving according to the fashion.
Several countries = different countries.
Reputation of parts = accomplishments, knowledge and experience.
Say after = agree with.
Modes of civility = polish, outward display of good manners.

(To be continued.)

—o—

Shakspere's 'Macbeth.'

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III.

Scene II.—*A camp near Forres. Alarum within. Enter* King Duncan, Malcolm, Donalbain, Lenox, *with Attendants, meeting a bleeding Sergeant.*

Dun.— What bloody man is that? He can report,
As seemeth by his plight, of the revolt
The newest state.

Mal.— 'This is the sergeant
Who like a good and hardy soldier fought,
'Gainst my captivity. Hail, brave friend!
Say to the king the knowledge of the broil
As thou didst leave it.

Serg.— Doubtful it stood,
As two spent swimmers that do cling together
And choke their art. The merciless Macdonwald
(Worthy to be a rebel; for to that
The multiplying villanies of nature
Do swarm upon him), from the western isles
Of kernes and gallowglasses is supplied;
And fortune, on his damned quarry smiling,
Show'd like a rebel's whore. But all's too weak,
For brave Macbeth—(well he deserves that name)—
Disdaining fortune, with his brandish'd steel,
Which smoked with bloody execution,
Like valour's minion, carved out his passage
Till he faced the slave,
Which ne'er shook hands nor bade farewell to him,
Till he unseam'd him from the nave to the chaps,
And fix'd his head upon our battlements.

Dun.—O valiant cousin! worthy gentleman!

Serg.—As whence the sun 'gins his reflection,
Shipwrecking storms and direful thunders break,
So from that spring whence comfort seem'd to come,
Discomfort swells. Mark, King of Scotland, mark!
No sooner justice had, with valour arm'd,
Compell'd these skipping kernes to trust their heels,
But the Norweyan lord, surveying vantage,
With furbish'd arms and new supplies of men,
Began a fresh assault.

Dun.—Dismay'd not this
Our Captains, Macbeth and Banquo?

Serg.—Yes;
As sparrows, eagles, or the hare the lion.
If I say sooth, I must report they were
As cannons overcharged with double cracks;
So they doubly redoubled strokes upon the foe,
Except they meant to bathe in reeking wounds,
Or memorise another Golgotha
I cannot tell—
But I am faint, my gashes cry for help.

Dun.—So well thy words become thee as thy wounds;
They smack of honour both. Go, get him surgeons.
Who comes here? [*Exit Sergeant, attended.*

Enter ROSSE.

Mal.—The worthy thane of Rosse.

Len.—What a haste looks through his eyes! So should he look
That seems to speak things strange.

Rosse.—God save the king!

Dun.—Whence camest thou, worthy thane?

Rosse.—From Fife, great king,
Where the Norweyan banners flout the sky,
And fan our people cold.
Norway himself, with terrible numbers,
Assisted by that most disloyal traitor,
The thane of Cawdor, began a dismal conflict;
Till that Bellona's bridegroom, lapp'd in proof,
Confronted him with self-comparisons,
Point against point, rebellious arm 'gainst arm,
Curbing his lavish spirit; and, to conclude,
The victory fell on us:—

Dun.—Great happiness!

Rosse.—That now
Sweno, the Norways' king, craves composition;
Nor would we deign him burial of his men,
Till he disbursed at Saint Colmes' Inch,
Ten thousand dollars to our general use.

Dun.—No more that thane of Cawdor shall deceive
Our bosom interest. Go, pronounce his present death,
And with his former title greet Macbeth.

Rosse.—I'll see it done.

Dun.—What he hath lost noble Macbeth hath won.

[*Exeunt.*

King Duncan is here represented, with his sons Malcolm and Donalbain, Lenox, a nobleman, and other courtiers, as waiting in the neighbourhood of his castle at Forres, for news of the engagement between the rebel troops and his army led by Macbeth and Banquo. Intelligence is brought by a wounded officer called in the text a sergeant, but in the stage direction of the first Folio, a captain.

1.—*Bloody*, covered with blood, 'bleeding' wounded. This is the literal meaning of the word. In line 18, it is used in the ordinary derived sense, *sanguinary*.

2.—Plight; condition, generally used in a bad sense (A.S. *plíht*, a pledge). *Of the revolt the newest state:* the latest intelligence concerning the state of the rebellion.

3.—*Sergeant* is to be reckoned as three syllables for the metre. This is not unusual in words having the letters *e* or *i* before another vowel. It was probably so read originally, but this would now sound absurd.

5.—*'gainst my captivity*, to prevent me from being taken prisoner. We must suppose Malcolm to have been engaged in the early part of the battle. *Hail.* The pause before this word takes the place of a syllable.

6.—*Say to the king*, etc. Tell the king what you know of the battle. *Broil*, like *hurlyburly* (sc. 1), is now used in the meaner sense only.

7.—*Thou.* The inferior is addressed by the *singular* pers. pronoun. So the king to Rosse (l. 48). But a nobleman addresses the king as *you* (plural), *e.g.* sc. 4, l. 23, etc. And this is the general usage in respectful language, as in the conversation between Macbeth and Banquo (sc. 3, l. 51), etc. Examples of this may be found in almost every page.

8.—This line is deficient in a syllable, as is often the case when lines are divided between two speakers. 8. *Spent*, exhausted. *As two*, etc. There is an ellipsis here. Supply, *as happens* (to two, etc.).

9.—*Choke their art*, prevent one another from exercising their art, and thus are choked, *i.e.*, suffocated, drowned.

10.—*Worthy*, in a bad sense; *to that*, with reference to that, to that end. (See Abbott, Sh. Gr. 186.)

11.—*Multiplying*, etc. Manifold natural vices.

12.—*Do swarm:* this expletive use of the auxiliary *do* is common in Tudor-English. Poets use it for the sake of metre.

13.—*Of kernes*, etc.; is supplied *with* kernes. The prep. *of* is used to express agency and instrumentality in O.E. (Old English), *e.g.*, 'They were baptised *of* him,' Matt. iii. 5 *Kernes* and *gallowglasses*. These are Irish (Keltic) words. They occur in Holinshed, and were well known in Tudor times through the frequent rebellions in Ireland. The *gallowglasses* were heavy-armed soldiers; the *kernes* were light-armed skirmishers. The former had coat-of-arms, axe, and sword; the latter javelins and daggers, or merely long knives.

14.—*Quarry* is a heap of dead game (from O. F. *corée*, entrails of game). *Damned, i.e.*, condemned. The army of the traitor is represented as a heap of prey, doomed to destruction. *Fortune, smiling*, etc. Fortune pretended to favour him, favoured him for a time, but only that she might give him over to his enemies. Some critics substitute *quarrel* for *quarry* (Fol. I.).

16.—*Brave Macbeth.* Here Macbeth is introduced, and thus this scene is connected with the preceding, while his courage and loyalty, as depicted by the sergeant and Rosse, stand in strong dramatic contrast with his subsequent treachery and crime.

17.—*Disdaining*, etc.: regarding with contempt the partial success of the rebels.

18.—*Smoked.* His sword reeked with slaughter.

19.—*Valour* is here personified. *Minion* is a favourite. Macbeth is thus represented as the special delight of valour: *i.e.*, as the bravest of men.

20.—*The slave*, the villain, *i.e.*, the rebel, Macdonwald.

22.—*Unseamed*, ripped him open; *nave*, navel; *chaps* for the jaws, *i.e.*, to the throat.
The pronouns are rather ambiguously used in this clause, but in line 21, *which* must refer to the rebel, *him* to Macbeth, and in line 22 *he* is Macbeth, and *him* the rebel. The general sense is, Macbeth did not give Macdonwald time even to say good-bye before he slew him. *Which* is here used of a person. (So, 'Our Father *which* art in Heaven.') In O. E. it was of all genders.

20.—The broken metre is here in accord with the speaker's excitement. (See Abbott Sh. Gr., 511). And the frequent metrical irregularities of this scene may be thus accounted for without supposing errors in the text.

24.—*Cousin.* This relationship is found in the old story.

25.—*'Gins* for begins, which is compound, though the simple form, except in verse, is never found in English.
Reflection for *shining:* As storms often arise in the east where the sun begins to shine.

27.—The figure now changes to a *fountain*, *swelling* first with good, then with evil. *Comfort* originally signified strength, support. (Lat. *fortis*, strong), and it has something of that sense here.

29.—The rebellion is followed by a Norwegian invasion, as in the old chroniclers. This gives Macbeth further opportunity to manifest his courage and fidelity to the king.
Justice. Macbeth has acted as instrument of the royal justice in punishing the rebels.

30.—*Skipping*, rapidly retreating; used satirically of the light troops.

31.—*But* for *than* after the comparative 'sooner.'
The *Norweyan lord*, is Sweno (or Swain) King of Norway. *Surveying vantage*, seeing that there was a favourable opportunity. He had landed previously.

32.—*Furbished*, polished, *i.e.*, well prepared, keen (French, *fourbir*).

34.—*Captains*, generals, as in O. E. ('Captain of the Lord's Host,' Josh. v. 15). To be reckoned metrically as three syllables.

35.—*As sparrows* (dismay), eagles, etc. Said ironically.

36.—*Sooth*, truth. A word now quite obsolete.

37.—This reference to cannons is an anachronism, as they were not used till three centuries after the time of Macbeth. But Shakspere seeks effect rather than literal accuracy. *Cracks*, used of the loud report when the cannon is fired. And similarly the 'crack of doom,' in a still grander sense. (iv. 1, l. 117). This is another instance of a word passing from a higher to a lower use. So, *murmur* is in

Latin used of the *roar* of the sea. The *crack* (or report) is put for that which causes it, viz., the charge, and the meaning is 'overloaded with double charges of powder,' producing violent noise and destruction.'

39.—*Except* (as a conjunction) is now supplanted by *unless*. *Wounds*, for the *blood* flowing from them. A metonymy.

40.—*Memorize*, to cause to be remembered. The sense is, 'Or make the field of battle as it were another place of skulls' (Mark xv. 22).

41.—His weakness renders him unable to conclude the sentence.

43.—*Thy words become thee*, etc. The sergeant is intentionally represented as using somewhat high-flown and hyperbolical language, as though thereby aiming to exalt Macbeth's prowess, and this the king acknowledges and praises. The whole scene has been considered as unworthy of Shakspere, and as not from his hand (see preliminary remarks), but without sufficient reason.

43.—For *so* in the principal sentence of a comparison we now use *as*, except with a negative ('not so good as—').

44.—*Smack*, taste, bear the flavour of. Originally used of the lips *striking* together.

45.—*Thane* (*thegn*, *thegen*) is the A.-S. name for the noble by service; *earl* was the noble by birth. It was eventually superseded by the latter term *earl*, in the Danish sense of ruler over a district. In 'Macbeth' and (Holinshed) *thane* is about equivalent to *earl*.

47.—*That seems*, etc., who evidently is about to utter, etc.

49.—*Flout*, insult, mock. The banners triumphantly wave in the air.

50.—*And fan*, etc. An hyperbolical expression to indicate the number of the enemy.

53.—*Cawdor* is introduced here, because his fall gives the title to 'Macbeth' (l. 65).

54.—*Bellona* was goddess of war, sister of Mars. 'Bellona's bridegroom' (like 'valour's minion') is a bold expression for Macbeth. '*Lapped* in *proof*,' covered with armour; *lapped*, folded, covered; *proof*, elliptical for 'armour of proof.'

55.—*Confronted*, etc., faced him and forced him to single combat. *Self-comparisons*, testing his valour and strength by comparing them with those of his assailant. *Him* refers to the King of Norway ('*Norway himself*,' 51), the subject of the principal sentence.

56.—Some remove the comma from *point* to *rebellious*.

57.—*Curbing his lavish spirit*, overpowering his violence. *Lavish*, unbridled (literally, flowing, wasteful).

58.—*That* is commonly used in Tudor-English to mark the result, for *so that*; (*that* consecutive).

59—*Composition*, peaceable arrangement, treaty of peace (cp. *compounding* with one's creditors).

61.—*Disbursed*, paid down (Fr. *bourse*, a purse). *St. Colme*, or St. Columba (from Ireland) converted the Scots to Christianity in the fifth century. *Inch* is Gaelic for an island; St. Colmes' Inch is now called Inchcolm.

62.—*Dollars*, the particular coin, though then unknown, and the precise sum, are stated to give effect by definiteness. *To our general* use, for the national expenses.

64.—*Deceive our bosom interest*, hold in my heart a place of which by his disloyalty he has shown himself undeserving. *Interest* here does not signify *profit*, *advantage*; but, as in the expression, 'to be interested,' to take an *interest* in any one. Latin *interesse*, to be between, among, to be of importance. *Pronounce*, etc., sentence him to immediate execution. *Present* is used in O.E. of that which takes place immediately after the *present* moment.

66.—Originally English dramatic verse was rhymed throughout. Shakspere gradually ceased to use rhymes except, as here, at the end of a scene, to give the effect of a cadence.

SCENE III. A HEATH.

Thunder. Enter the Three Witches.

1 *Witch.*—Where hast thou been, sister?

2 *Witch.*—Killing swine.

3 *Witch.*—Sister, Where thou?

1 *Witch.*—A sailor's wife had chestnuts in her lap,
And munch'd, and munch'd, and munch'd. 'Give me,' quoth I.
'Aroint thee, witch,' the rump-fed ronyon cried.
Her husband's to Aleppo gone, master of the Tiger.
But in a sieve I'll thither sail,
And like a rat without a tail,
I'll do, I'll do, and I'll do.

2 *Witch.*—I'll give thee a wind.

1 *Witch.*—Thou'rt kind.

3 *Witch.*—And I another.

1 *Witch.*—I myself have all the other.
And the very ports they blow,
All the quarters that they know
In the shipman's card.
I will drain him dry as hay;
Sleep shall neither night nor day,
Hang upon his pent-house lid;
He shall live a man forbid;
Weary se'nnights nine times nine
Shall he dwindle, peak, and pine.
Though his bark cannot be lost
Yet it shall be tempest-toss'd.
Look what I have.

2 *Witch.*—Show me, show me.

1 *Witch.*—Here I have a pilot's thumb,
Wreck'd as homeward he did come. (*Drum within.*)

3 *Witch.*—A drum, a drum!
Macbeth doth come.

All.—The weird sisters, hand in hand,
Posters of the sea and land.
Thus do go about, about:
Thrice to thine, and thrice to mine,
And thrice again to make up nine.
Peace! the charm's wound up.

The weird sisters now 'meet again,' as they announce in the first scene, in order to hold their interview with Macbeth. Before he appears, they further express their delight in inflicting suffering. Their speeches begin in an irregular metre, passing into trochaics.

2.—*Killing swine*, *i.e.*, causing their death by disease. The destruction of cattle by such means was one of the commonest charges against witches.

4-10.—She had appeared in the form of an old woman to the sailor's wife, who refused to give her assistance, and abusively called her a *witch*; she therefore threatens vengeance on the husband.

5.—*Munched*, knawed, chewed (Latin, *manduco*). *Quoth* is an obsolete verb, used in Shakspere's time only in the past tense. The present tense is seen in *bequeath*, but with a weak præterite.

6.—*Aroint*, stand aside, begone. From *a*, and A.-S., *rum*; *room*, *place*; *i.e.*, *give place*. The *t* represents *thee*. Rump-fed, *fat*, 'fed on the best, and yet refusing me a chestnut.' *Ronyon*, a term of abuse; covered with cutaneous eruptions (from being overfed). French, *rogne*, scurf, as though '*scurvy creature*.'

9, 10.—Witches were represented as sailing in sieves, and assuming the shape of rats and other animals. *Like a rat*, *i.e.*, *as* a rat, in the form of one. Perhaps there is a reference to the mischief that rats work in the timbers of vessels.

10.—Observe the spiteful malice exhibited in the repetition of the words 'munch,' and 'I'll do.'

11.—They have power not only to ride in the air, but also over the winds and the waves (l. 24).

14.—*Other* is here plural; now *others*. The old plural was *othere* (*e* sounded). See Luke xxiii. 32, 'And there were also two *other*, malefactors, led with him,' etc.

15.—And [I have] *the very ports* [to which] *they blow*. I have power to make them blow towards what ports I please.

17.—The *shipman's card*, the mariner's compass.

18.—I will wither up the moisture of his frame by hunger and anxiety.

20.—*Pent-house lid*, eyelid; which slants to the face like a pent-house, or shed attached to the side of a building (French, *appentis*, from Latin *pendo*, to hang).

21.—*Forbid*, under a ban, or excommunication. The prefix *for* has frequently the sense of negation or opposition; *e.g.*, *get* and *forget*, *do* and *forbo*; so *bid* and *forbid*. *Forbid* is the participle, properly, *forbidden*. There was much confusion in the formation of the perfect participle from the time of Chaucer to the middle of last century; so that the present usage is sometimes really the more ancient.

22.—*Se'nnights*, weeks, like *fortnight*. The northern Germans reckoned by nights instead of days.
Nine times nine, odd numbers were favourites in witchcraft, like everything that was not even, and regular, and right.

23.—*Dwindle*, *peak*, and *pine*. These words are nearly synonymous; to *peak* is to become sickly, meagre.

24, 25.—It is here indicated that great as is their power, it is still under control, 'his bark cannot be lost.'

29.—The 'pilot's thumb' was retained as a trophy of her power.

30.—*Macbeth doth come*. Here again the human and superhuman are connected.

32.—They now join hands and dance in a circle nine times, and their magical influence over Macbeth is thus secured.

33.—*Posters*, rapid messengers. Generally this word appears as *post*, whether of the runner or rider. It is derived from Latin *positus* (set, *pono positum*) from the relays, the changes of men and horses at fixed stations.

Weird sisters. See introductory remarks to this Act. The word *weird* was originally a noun, and was also used in the plural (*weirds*) by early English writers, as Chaucer. The A.-S. *wyrd*, fate, is connected with *weorthan*, to be, exist. In Germanic mythology, the three sisters presided over the Past, the Present and the Future.

(To be continued.)

—o—

Iphigenia in Aulide.

ACT I.—*continued.*

Achilles. No, no! all these pretences are too ingenious:
You see too far into the secrets of the gods.
I! to be detained by vain threats!
And flee from the honour which awaits me on your footsteps!
The Fates, it is true, have predicted it to my mother,
When she accepted a mortal as her husband.
I may choose, it is said, between many inglorious years,
And a short life followed by a long-lived memory.
But, as I must finally come to the grave,
Would I, a useless burden upon earth,
Too sparing of the blood I have received of a goddess,
Await at my father's an obscure old age;
And always avoiding the path of glory,
Leave no memory and die unknown?
Ah! let us not frame such unworthy impediments;
Honour speaks, it suffices: this is our oracle.
The gods are the sovereign masters of our lives,
But, my lord! our glory is in our own hands.
Why should we be troubled by their supreme orders?
Let us only think of rendering ourselves as immortal as they;
And, leaving fate alone, let us hasten where valour
Promises us a destiny as great as theirs.
That place is Troy, and I hurry there; and in spite of what is predicted to me,
I only ask of the gods a wind which will lead me there;
And should I alone have to besiege it,
Patroclus and I, my lord, we will go to avenge you.
But no! it is into your hands that fate delivers it;
And in fact I only wish to have the honour to follow you.
I no longer urge you to approve of the love
Which was driving me from these parts;
This same love, careful of your renown,
Requires that my example should here encourage the army,
And especially forbids me to leave you
To the cautious advice which is so boldly given you.

SCENE III.—AGAMEMNON, ULYSSES.

Ulysses. You hear, my lord; at whatever cost
He will fly to Troy, and pursue his aim.
We feared his love: and he himself to-day,
By a fortunate error, arms us against him.

Agamemnon. Alas!

Ulysses. What must I conjecture by this sigh?
Is it some murmur of the rebellious blood?
Am I to believe that one night has sufficed to move you?
Can it be your heart that has just addressed us?
Think: you owe your daughter to Greece:
You have promised her to us; and, upon this promise
Calchas, whom every day the Greeks consult,
Has foretold the winds' infallible return.
If the effect be contrary to his predictions,
Do you think Calchas will remain silent;
That his complaints, which in vain you will try to appease,
Will allow the gods to deceive without accusing you of being the cause of it?
And who can tell what the Greeks, when deprived of their victim,
Will be led to by a wrath which they will think lawful?
My lord, take care not to compel a furious people
To decide between you and the gods.
Is it not you in fact of whom the pressing voice
Has called us all to the fields of Xante;
And who, from town to town, attested the oaths,
Which, in former days, where taken by the suitors of Helen,
When almost all the Greeks, your brother's rivals,
Asked her in marriage of her father Tyndareus?
We then swore to defend the rights
Of any happy husband on whom the choice might fall.
And should any insolent one carry off the one he had won,
Our hands promised him the ravisher's head.
But without you, this oath, which love had prompted,
Free from that love, would we have remembered it?
You alone, drawing us away from fresh love,
Have caused us to leave our children and wives.
And, when from all parts we are assembled here,
The honour of avenging you alone shining in our eyes;
When Greece, already giving you her vote,
Acknowledges you as the author of that great work;
When her kings, who might dispute you this place,
Are ready to shed their blood in your service,
Agamemnon alone, refusing victory,
Dares not with a little blood purchase so much glory;
And allowing himself to be moved with fear at the very outset,
Commands the Greeks but to bid them retire.

Agamemnon. Ah, lord! how, far removed from the trouble with which I am oppressed,
Your heart easily shows itself magnanimous!
But if you saw, crowned with a mortal diadem,

Your son Telemachus approaching the altar,
We should soon see you, troubled by that dreadful image,
Change this proud speech into tears,
Feel the affliction in which I am to-day,
And cast yourself between Calchas and him!
My lord, you know it, I have given my word;
And, should my daughter come, I consent to her being sacrificed.
But if, in spite of all my care, her happy fate
Keeps her in Argos, or bars her the way,
Suffer that, without urging that barbarous sight,
I may explain this obstacle in favour of my blood.
That I may for my daughter accept the help
Of some more tender god, who watches over her,
Your counsels have had but too great a sway over my heart;
And I blush.....

Scene IV.—Agamemnon, Ulysses, Eurybate.

Eurybate. Lord.....

Agamemnon. Ah! what is going to be told me?

Eurybate. The queen, whose footsteps I have preceded,
Will soon put your daughter into your arms.
She approaches. For some time she has wandered
In the woods, which appear to conceal the entrance to the camp;
It is only with some trouble that in their darkness
We have been able to retrace the road we had left.

Agamemnon. Good heavens!

Eurybate. She also brings that young Eriphyle,
Whom Lesbos has delivered into Achilles' hands,
And who comes, she says, in Aulide
To consult Calchus about her destiny, which is unknown to her.
The news of their arrival is already spread;
And a multitude of delighted soldiers
Already form numberless vows for the happiness of Iphigenia,
The beauty of whom they specially admire.
Some respectfully gathered round the queen;
Others asked me the reason for which she has come.
But they all confessed that if ever the gods
Had placed more glorious a king upon the throne,
Equally loaded with their special favours,
Never was a father happier than you.

Agamemnon. Eurybate, it is enough; you can leave us;
The rest concerns me, and I will think of it.

Scene V.—Agamemnon, Ulysses.

Agamemnon. Good Heaven! it is thus that, making sure of thy vengeance,
Thou undoest all that my vain prudence has done!
If only, free in my unhappiness,
I could with tears alleviate my grief!
O sad destiny of kings! Slaves as we are
Of the rigour of fate and of the speeches of mankind,
We are ever besieged by witnesses;
And those amongst us, who are most unhappy, are those who least dare to weep!

Ulysses. I am a father my lord, and as weak as any other;
My heart easily takes the place of yours;
And, shuddering under the blow which causes you to sigh,
Far from blaming your tears, I am ready to weep.
But your love has no longer any lawful excuse;
The gods have brought their victim to Calchas:
He knows it, he awaits her; and if he see her linger,
He will come himself and loudly demand her.
We are yet alone: hastily shed
The tears which so tender an interest draws from you;
Weep for that blood, weep; or rather consider, without blenching,
The honour which it will reflect.
See the whole of Hellespont foaming under our oars,
And treacherous Troy delivered to the flames;
See her people in chains, Priam at your feet,
Helen from your hands given back to her husband;
See the sterns of your ships being crowned
In the same Aulide to which you have together returned,
And that happy triumph which will become
The eternal subject of conversation of times to come.

Agamemnon. My lord, I know what little power my efforts have:
I yield and leave the gods to oppress innocence.
The victim will soon follow you;
Go. But still keep Calchas silent;
And assisting me in keeping secret this fatal mystery,
Allow me to keep a mother away from the altar.

ACT II.

Scene I.—Eriphyle, Doris.

Eriphyle. Let us not trouble them, Doris, let us withdraw, and leave them in a father's and a husband's arms; and whilst they fondly give vent to their love, let us leave my sadness and their joy both to take a free course.

Doris. What, madam! Shall you, ever thus sharpening your grief, see nothing more but ground for tears? I know that everything is displeasing to the eyes of a captive, that no pleasures follow her in her chains; but, in the unhappy time, when again crossing the water, we followed the conqueror of Lesbos against our will; when, a timid prisoner in his vessel, you saw before you that homicidal victor—shall I mention it? your eyes, less bathed in tears, were not so ready to deplore your misfortunes. Now, Fortune smiles upon you; lovely Iphigenia is attached to you by a sincere affection: she pities you, looks upon you as upon a sister, and even in Troy you could not be treated more kindly. You wished to see the Aulide to which her father calls her, and with her Aulide sees you arrive: and yet, by some means which I cannot conceive, your grief increases and at every moment grows worse.

Eriphyle. How now! does it seem to thee that sad Eriphyle should be so quiet a witness to their joy? Thinkest thou that my troubles should vanish at sight of happiness which I cannot enjoy? I see Iphigenia in a father's arms; she is the whole pride of a beautiful mother; and I, ever exposed to new dangers, left in a stranger's arms from my childhood, I was born and I have lived without either father or mother to deign smile upon me. I do not know who I am; and to complete the horror of my fate, a fearful oracle binds me to my error; and when I try to find who has given me birth, tells me that without perishing I cannot know myself.

Doris. No, no, you must seek it to the last; an oracle always finds pleasure in concealing its true meaning, which it always hides under another sense. You will lose your false name and again bear your own; that is all the danger in which you can be, and it is perhaps in that way that you are to perish. Think; your name was changed in your infancy.

Eriphyle. That is all the knowledge I have of myself; and thy father, who was an unfortunate witness of the rest, never allowed me to discover more. Alas! in that Troy, where I was awaited, my glory, said he, would be restored to me; I was about, by recovering my name and my rank, to see in my blood that of the greatest kings. Already I was perceiving that famous town, when Heaven leads that unmerciful Achilles to Lesbos. All yield—all resent his fatal efforts. Thy father, buried among the numerous dead, leaves me in chains and unknown to myself; and of so many dignities which were promised me, I, a contemptible slave of the Greeks, have only been able to keep the pride of a blood which I cannot prove to be mine.

Doris. Ah! madam, how cruel must seem to you the hand which has deprived you of so faithful a witness! But Calchas is here, Calchas, who is so renowned, and who was always acquainted with the secrets of the gods. Heaven often speaks to him: instructed by such a master, he knows all that was and all that is to be. Could it be possible for him not to know your parents? This camp even is filled with protectors for you. Iphigenia, upon marrying Achilles, will, with his support, offer you a refuge; this she has promised and sworn before me: it is the first token she will expect of his faith.

Eriphyle. What would'st thou say, Doris, if this marriage were, surpassing all the rest, the most fatal of all my woes?

Doris. What, Madam!

Eriphyle. Thou art astonished to see that my grief will in no way be alleviated. Listen, and thou wilt be surprised that I can still live. It is little to be a stranger, unknown and captive; that fatal destroyer of the poor Lesbians, that Achilles, the author of both your troubles and mine, he, whose cruel hand took me away a prisoner, who, at one blow, deprived me of the secret of my birth, and of thy father, he, of whom all, even to the name, should be odious to me, is in my eyes the dearest of mortals.

Doris. Ah! what do you say!

Eriphyle. I always hoped that an eternal silence would conceal my weakness; but my over-loaded heart draws this speech from me, and addresses you once to be ever afterwards silent. Do not ask me upon what hope I saw myself possessed of this fatal love. I cannot say it was the feigned pity with which I thought to see Achilles honour my miseries. Heaven, no doubt, has found an inhuman joy in gathering against me all the darts of its hatred. Shall I again recall the fearful remembrance of the day upon which we were both thrown in captivity? I remained long without sight and lifeless in the cruel arms by which I was torn away. At length my saddened eyes sought the light, and, under the pressure of an arm stained with blood, I trembled, Doris, and feared to see the awful face of some fierce warrior. I entered his vessel, detesting his fury, and always averting my eyes with horror. I saw him: there was nothing of fierceness in his looks; I felt the reproach die on my lips, I felt my heart declaring against me, and, forgetting my anger, could do nothing but weep. I allowed myself to be led by that amiable guide. I loved him in Lesbos, and I love him in Aulide. Iphigenia in vain offers to protect me, and readily puts forth a comforting hand. Sad effect of the passions which torment me! I accept the hand she has offered me, but to arm myself against her, and, without disclosing my thoughts, to cross her happiness, which I cannot endure.

Doris. And what could your weak hatred do against her? Would it not have been better to remain prisoner at Mycenæ, to avoid the torments which you are seeking here, and resist the flames, which must be concealed?

Eriphyle. I wished it so, Doris; but however sad the image of her glory on this shore appeared to me, I was forced to consent to the fate that was leading me. A secret voice ordered me to depart, told me that my importunate presence might perhaps also bring here my misery; that, by approaching those two happy lovers, some of my troubles might fall upon them. That is what brings me here, and not the impatience to know to whom I owe my sad birth; or rather, their marriage will dictate to me what I have to do. If it take place it is enough—all is over with me. I will perish, Doris; and by a sudden death will hide my shame in the darkness of the tomb, without seeking the parents so long unknown, and whom my foolish love has so far dishonoured.

Doris. How I pity you, madam! and how tyranny..

Eriphyle. Thou seest Agamemnon with Iphigenia.

(To be continued.)

—o—

Quarterly Arithmetical Tests.

STANDARD I.—FIRST QUARTER.

1. 205
670
39
58
4

2. 658
103

3. 927
425

4. 10 × 2;
3 × 7;
11 × 4.

SECOND QUARTER.

1. 82
517
6
930
45

2. 574
49

3. 450
407

4. 5 × 8;
6 × 3;
4 × 5.

THIRD QUARTER.

1. 764
9
26
807
3

2. 913
518

3. 800
734

4. 4 × 4;
6 × 7;
12 × 5.

Standard II.—First Quarter.

1. 392 + 4,015 + 60,708 + 59,639 + 8,570 + 284.

2. 79,406 × 58.

3. How much greater is 63,128 than 57,093?

4. 34d.; 45d.; 57d.

Second Quarter.

1. Multiply 5,079 by 790.

2. Divide eighty thousand four hundred by five, and write the answer in words.

3. There are 8 pints in a gallon; how many pints are there in 397 gallons?

4. 78d.; 83d.; 97d.

Third Quarter.

1. 91,260 ÷ 12.

2. 47,508 × 3,906.

3. If eggs are 18 for a shilling, how many can I get for 4s. 6d.?

4. 112d.; 129d.; 135d.

Standard III.—First Quarter.

1. Divide one hundred and seven thousand and nineteen by two hundred and seventy-eight.

2. A boy sold 345 newspapers in four days. He sold the same number on three days, and 87 on the fourth day. How many did he sell on each of the other days?

3. Divide three quarters of a million by three times forty-eight.

4. How many times can 579 be subtracted from 409,932?

Second Quarter.

1. What is the sum of £407 13s. 9½d., £18 10s. 5¾d., £950 7s. 11¼d., £6 18s. 7d., £42 16s. 8¾d., and 12s. 10¼d.?

2. A shopkeeper bought a box of eggs, and found that half were bad. After selling 158 he had 37 left; how many eggs were there in the box?

3. Take five pounds and nine pence farthing from thirty pounds seventeen shillings and three farthings.

4. A gentleman had twenty-nine pounds and gave away two shillings out of every sovereign. How much had he left?

Third Quarter.

1. Find the difference between twelve thousand and sixteen pounds fourteen shillings and two pence halfpenny and three thousand eight hundred and nine pounds sixteen shillings and seven pence three farthings.

2. How many small parcels, each weighing 26 lbs., can be made from two large ones weighing 8,643 lbs. and 6,905 lbs.?

3. Add three thousand four hundred and six pounds seventeen shillings and nine pence three farthings, five hundred and ninety-two pounds fifteen shillings and seven pence halfpenny, twenty thousand seven hundred and fifty pounds eight shillings and ten pence three farthings, six thousand eight hundred pounds thirteen shillings and five pence, and seventy-nine thousand and eighty-four pounds nineteen shillings and eleven pence farthing.

4. A clerk copied £6 9s. for 6s. 9d., and 7s. 6d. for £7 6s. What was the amount of error for both sums?

Standard IV.—First Quarter.

1. £30,016 15s. 11d. ÷ 68.

2. Multiply 590 7s. 10¾d. by 54.

3. How much is 907 times £47 13s. 8¼d.?

4. A man bought nine horses for £315, and sold them for 400 guineas; how much did he gain on each horse?

Second Quarter.

1. How many times can £3 18s. 9d. be taken from £1,716 15s.?

2. Find the number of drams in 78 tons 25 lbs.

3. What is the sum of 259 half-crowns and 367 florins?

4. Reduce twenty-nine thousand and twenty-nine square inches to square yards.

Third Quarter.

1. How many times can I fill a peck measure from 218 qrs. 6 bus. 1 pk.?

2. What is the difference in seconds between 3 weeks 5 days and 23 days 19 hrs. 47 min. 36 sec.?

3. If I divide £107 8s. 1d. among 346 boys, how many farthings could each boy get for his share?

4. How many lengths of 5 ft. 8 in. can be cut from 7 pieces, each measuring 51 yards?

Standard V.—First Quarter.

1. What is the cost of 4,709¾ cwt. at 13s. 7d. per cwt.?

2. Find the value of 786 gals. 3 qts. 1 pt. at 15s. 10d. per gallon.

3. At £1 17s. 4d. per qr., what is the value of 3 tons 17 cwt. 2 qrs. 19 lbs. 11 oz.?

4. Find the cost of 19,057 articles at £19 7s. 2¾d. each.

Second Quarter.

1. If 25 men can mow a field in 21 days, how many more men would mow it in 15 days?

2. What would be the cost for 35 hrs. 28 min. 45 sec. at 13s. 9d. per hour?

3. If 259 articles cost £7 4s. 1¾d., what will 63 articles cost?

4. Bill:—

29 books at 1s. 8d. each;
70 copybooks at 2½d. each;
11 gals. ink at 7d. per quart;
1,000 envelopes at 25 for 3d.;
5½ gross pens at 3½d. per doz.

Third Quarter.

1. Add the least and the greatest of $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{6}$.

2. Simplify:—$(\frac{2}{5} + \frac{3}{5}) - (\frac{5}{8} + \frac{3}{16})$.

3. A tobacconist gains 7d. on every lb. of tobacco. How many cwt. does he sell in a year, if he gain £294?

4. I paid $\frac{3}{10}$, and then $\frac{1}{6}$ of a bill. What part of the bill do I still owe?

STANDARD VI.—FIRST QUARTER.

1. Divide the less of the two fractions $\frac{7}{16}$ and $\frac{5}{18}$ by the greater.

2. What is the L.C.M. of the numbers on the face of a clock?

3. By what must 150 be divided to give $(\frac{3}{7} + \frac{5}{12} + \frac{19}{21})$?

4. The larger of two numbers is 47·506, and the smaller is one-fourth of the larger. What is the difference of the two numbers?

SECOND QUARTER.

1. Reduce $\frac{5}{6}$ of 7 stone 7 lbs. to the decimal of $\frac{3}{4}$ of a ton.

2. A gentleman's salary is £9 15s. weekly. What is the amount of his annual income-tax at 5d. in the pound?

3. What part of 5 guineas is $\frac{7}{16}$ of 27 half-crowns?

4. Find the difference in square yards between ·25 of ·25 of an acre and ·7 of ·125 of 3 acres.

THIRD QUARTER.

1. If $\dot{3}\dot{5}$ of a ton cost £2 15s., what will $4\dot{6}\dot{7}\dot{8}$ cwt. cost?

2. What is the simple interest on £476$\frac{7}{8}$ for 9 months at 6 per cent.?

3. I spent £19·4875 and £13 17s. 4d., and have $\frac{1}{5}$ of my money left. How much had I at first?

4. In what time will £278 double itself at 4$\frac{1}{2}$ per cent.?

STANDARD VII.—FIRST QUARTER.

1. If 350 sixpenny loaves serve 60 men for 18 days, how many fourpenny loaves will serve 48 men for 21 days?

2. In what time will 300 guineas amount to £357 10s. 6d. at 3 per cent.?

3. If the cost of carpeting a room with carpet 27 inches wide at 3s. 9d. a yard be £6 10s., what will be the cost with carpet 1 yard wide at 4s. 6d. per yard?

4. A, B, and C can do a piece of work in 6 days; A alone can do it in 18 days, and B alone in 20 days. How long would it take C to do it?

SECOND QUARTER.

1. A man was in business for six years. For the first three years he saved on an average £137 10s.; the next year he lost £28 15s.; and for the last two years he saved £149 7s. 6d. yearly. What was his annual average savings?

2. Three men went into partnership. The first put £300 into the business, the second £450, and the third £950. They gained £595; what ought the first to receive?

3. A train travels 500 miles. The first hour it travels 38 miles, the next 35, and the third 37 miles. What is the average speed per hour for the remainder of the journey to do the whole distance in 12 hours?

4. Simplify:—

$$\frac{3\frac{1}{4} \times 4\frac{1}{5} \times \cdot 6}{7\cdot 8},$$

and give the answer as a decimal.

THIRD QUARTER.

1. A house is worth £768, and it is sold at a loss of 7$\frac{1}{2}$ per cent. What is the selling price?

2. At what rate per cent. will £586 10s. gain £36 13s. 1$\frac{1}{2}$d. in 1 year 8 months?

3. If by selling an article for £50 8s. I lose 16 per cent., what shall I gain or lose per cent. by selling it for £67 4s.?

4. A grocer sells tea in 3 lb. packets for 11s. 3d., and gains 12$\frac{1}{2}$ per cent. Find the cost price per lb.

ANSWERS.

STANDARD I.

	FIRST.	SECOND.	THIRD.
1.	976.	1,580.	1,609.
2.	555.	525.	395.
3.	502.	43.	66.
4.	20; 21; 44.	40; 18; 20.	16; 42; 60.

STANDARD II.

	FIRST.	SECOND.
1.	133,608.	4,012,410.
2.	4,605,548.	16,080.
3.	6,035.	3,176 pints.
4.	2s. 10d.; 3s. 9d.; 4s. 9d.	6s. 6d.; 6s. 11d.; 8s. 1d.

THIRD.

1. 7,605.
2. 185,566,248.
3. 81 eggs.
4. 9s. 4d.; 10s. 9d.; 11s. 3d.

STANDARD III.

	FIRST.	SECOND.	THIRD.
1.	384 + 267.	£1,427 0s. 4½d.	£8,206 17s. 6¾d.
2.	86 newspapers.	390 eggs.	598 parcels.
3.	5,208 + 48.	£25 16s. 3½d.	£110,635 15s. 8¼d.
4.	708 times.	£26 2s.	16s. 3d.

STANDARD IV.

	FIRST.	SECOND.
1.	£441 8s. 5½d. + 36 q.	436 times.
2.	£31,881 6s. 4½d.	44,734,720 drams.
3.	£43,249 14s. 6¾d.	£69 1s. 6d.
4.	£11 13s. 4d.	22 sq. yds. 3 ft. 85 in.

THIRD.

1. 7,001 times.
2. 187,944 seconds.
3. 298 farthings.
4. 189 pieces.

STANDARD V.—FIRST.

1. £3,198 14s. 1½d.
2. £622 18s. 10½d.
3. £579 19s. 7d.
4. £368,971 6s. 2¾d.

SECOND.

1. 10 men.
2. £24 8s. 4½d.
3. £1 15s. 0¾d.
4. £2 8s. 4d. + 14s. 7d. + £1 5s. 8d. + 10s. + 19s. 3d. = £5 17s. 10d.

THIRD.

1. 1½.
2. $\frac{11}{112}$.
3. 90 cwt.
4. $\frac{8}{15}$.

STANDARD VI.

	FIRST.	SECOND.	THIRD.
1.	$\frac{42}{43}$.	·052083.	£1 16s. 2½d.
2.	27,720	£10 11s. 3d.	£21 9s. 2½d.
3.	93$\frac{1}{3}$.	$\frac{8}{21}$.	£60 0s. 9d.
4.	35·6295.	968 sq. yds.	22$\frac{1}{3}$ years.

STANDARD VII.

	FIRST.	SECOND.	THIRD.
1.	490 loaves.	£113 15s.	£710 8s.
2.	4$\frac{1}{2}$ years.	£105.	3$\frac{3}{4}$ per cent.
3.	£5 17s.	43$\frac{1}{3}$ miles.	12 per cent. gain.
4.	16$\frac{4}{11}$ days.	1·083.	3s. 4d.

HOLD UP THE RIGHT HAND!

Firmly, and with spirit.

1st TREBLE.
2nd TREBLE.
BASS.
1. Hold up the right hand! hold up the left hand! Now hold up
2. Point to the east - ward! point to the west - ward! Now to the
3. Let all be seat - ed! cross arms to el - bows! Straight keep the
KEY C. Firmly and with spirit.
both! then (1) clap! clap! clap! Now let the (2) black - smith strike on the an - vil!
south where sun shines bright! Raise fin - gers up - ward! now point them down - ward!
feet— the head up - right! Now see the sai - lor (4) pull at the rope, boys!
CHORUS.
Now let the cob - bler give his rap, tap, tap! (1) (2) (3)
Stretch out the left arm! now stretch out the right! Clap! clap! bang! bang! rap, tap, tap!
Now watch the wood-man (5) wield his axe so bright!
CHORUS. f
(1) (2) (3)
Clap, clap, at play! joy - ous and gay! Bang! bang! rap! tap! work, work a - way!

The words generally will indicate the suitable action. (1) Clap hands smartly. (2) Strike right arm and elbow downwards, with fist clenched. (3) Tap with right hand from the elbow. (4) Pull hand over hand, as on a rope. (5) Strike with both arms from the right shoulder obliquely, as if cutting down a tree.

Tests in Mental Arithmetic.

Standard I.

1. What is the cost of 21 oranges at ½d. each? 10½d.
2. What change would you get out of a shilling? 1½d.
3. If I divide 21 oranges among 7 boys, how many will each boy get? 3.
4. I had a florin and spent 1s. 5d.; how much had I left? 7d.
5. How many farthings could I get for 7d.? 28.
6. What is the half of 7d.? 3½d.
7. What is the half of 3½? 1¾d.
8. How much is 4d., 5d., and 6d.? 1s. 3d.
9. How many lbs. of sugar at 3d. could you get for that amount? 5.
10. How many are 5 dozen? 60.
11. How many score are equal to that number? 3.
12. What is the cost of 3 lbs. of beef at 8d per lb? 2s.

Standard II.

1. How many pence are there in half-a-crown and a florin? 54.
2. What is the third part of 54? 18.
3. How many shillings are there in 2 guineas? 42.
4. Find the cost of 100 oranges at ½d. each. 4s. 2d.
5. What change would you get out of a crown? 10d.
6. If I divide 100 oranges among 4 boys, how many would each boy get? 25.
7. How many score are there in 100? 5.
8. Add 5 times 7 to 4 times 3. 47.
9. How many more are required to make 4 dozen? 1.
10. How many ounces are there in ½ lb.? 8.
11. What would ½ lb. of tea cost at 3d. per oz.? 2s.
12. How many lbs. could you get for a sovereign? 5.

Standard III.

1. I have 4 florins and 5 sixpences and spend half-a-sovereign. How much have I left? 6d.
2. How many pence are there in 4 florins? 96.
3. What is the sixth part of 96? 16.
4. Multiply 16 by the half of a score. 160.
5. What is the cost of 160 hats at 1s. 6d. each? £12.
6. If I give 5d. each to 24 boys how much do I require? 10s.
7. How many lbs. of sugar at 4d. could you get for 10s.? 30.
8. What is the cost of ¼ lb. of tea at 3½d. an ounce? 1s. 2d.
9. What would ½ stone of apples cost at 1½d. per lb.? 10½d.
10. How many lbs. are there in 2 qrs.? 56.
11. What part of a cwt. is 2 qrs.? ½.
12. How many weeks are there in 3 years? 156.

Standard IV.

1. Multiply ⅐ of 63 by ¼ of 32. 72.
2. How many florins are equal to £9 10s.? 95.
3. What would 14 ducks cost at 5s. 6d. a couple? £1 18s. 6d.
4. How many sixpences are there in that amount? 77.
5. How much more is required to make 2 guineas? 3s. 6d.
6. What is the eighth part of that? 5¼d.
7. What must you add to ¼ ton to make 9 cwt.? 4 cwt.
8. What part of an hour is 10 minutes? ⅙.
9. What part of a minute is 6 seconds? $\frac{1}{10}$.
10. How many hours are there in the month of April? 720.
11. How many score are there in that number? 36.
12. How many shillings could you get for 720 farthings? 15s.

Standard V.

1. What is the cost of 7 dozen caps at 8½d. each? £2 19s. 6d.
2. What would 350 envelopes cost at 9d. per 100? 2s. 7½d.
3. How much is 9s. a day for the month of April? £13 10s.
4. What is the value of 20 hats at 7s. 9d. each? £7 15s.
5. Find the sum of 50 shillings, 50 sixpences, and 50 pence. £3 19s. 2d.
6. If the sixpenny loaf weigh 4 lbs., what should a 6 lb. loaf cost? 9d.
7. If 7 lbs. of sugar cost 1s. 9d., what will 5½ lbs. cost? 1s. 4½d.
8. Express 13 as an improper fraction, having 6 for denominator. $\frac{78}{6}$.
9. What fraction of a crown is 3s. 6d.? $\frac{7}{10}$.
10. What is the area of a slate 8 in. by 5½ in.? 44 sq. in.
11. How many square yards are there in a square room, the side of which is 18 feet? 36.
12. What would £250 amount to in 7 years at 4 per cent.? £320.

Standards VI. and VII.

1. From the square of 13 take the square of 11. 48.
2. If I give away ⅓ of my money, and have a guinea left, how much had I at first? £1 4s. 6d.
3. What is the sum of ⅓, ¼, and ⅕? $\frac{47}{60}$.
4. Express that as a decimal. $\cdot\dot{7}8\dot{3}$.
5. What is ·25 of 19s. 3d.? 4s. 9¾d.
6. Divide ·16 by ·05. 3.

7. If I borrow £300 for 5 months, how long should I lend £200 in return? $7\frac{1}{2}$ months.

8. If 3 oxen are worth 20 sheep, and 4 sheep are worth £10, what are 24 oxen worth? £400.

9. What is the interest on £38 10s. for 3 years at 5 per cent.? £5 15s. 6d.

10. What will £45 amount to in 4 months at 4 per cent.? £45 12s.

11. At $\frac{1}{8}$ per cent. what is the brokerage for investing £3,000? £3 15s.

12. If I purchase a watch for £20, and sell it for $\frac{7}{8}$ of the cost price, what do I lose per cent.? $12\frac{1}{2}$ per cent.

Certificate Examination, 1888.

Male Candidates.

FIRST YEAR.

Algebra and Mensuration.

(THREE *hours allowed for this paper.*)

Candidates are not permitted to answer more than NINE questions in Algebra, and TWO questions in Mensuration.

The solution must be given at such length as to be intelligible to the examiner, otherwise the answer will be considered of no value.

Algebra.

1. Find the product of $a^{\frac{3}{2}} - ab^{\frac{1}{2}} + a^{\frac{1}{2}}b - b^{\frac{3}{2}}$ and $a + a^{\frac{1}{2}}b^{\frac{1}{2}} + b$, and divide $6x^5 + 13x^4 - 14x^3 - 17x^2 + 18x - 4$ by $3x^2 + 2x - 4$.

$$\begin{array}{l} a^{\frac{3}{2}} - ab^{\frac{1}{2}} + a^{\frac{1}{2}}b - b^{\frac{3}{2}} \\ a + a^{\frac{1}{2}}b^{\frac{1}{2}} + b \\ \hline a^{\frac{3}{2}} - a^2b^{\frac{1}{2}} + a^{\frac{3}{2}}b - ab^{\frac{3}{2}} \\ \quad + a^2b^{\frac{1}{2}} - a^{\frac{3}{2}}b + ab^{\frac{3}{2}} - a^{\frac{1}{2}}b^2 \\ \quad\quad + a^{\frac{3}{2}}b - ab^{\frac{3}{2}} + a^{\frac{1}{2}}b^2 - b^{\frac{3}{2}} \\ \hline a^{\frac{3}{2}} \quad\quad + a^{\frac{3}{2}}b - ab^{\frac{3}{2}} \quad\quad + b^{\frac{3}{2}} \end{array}$$

∴ Product = $\underline{a^{\frac{3}{2}} + a^{\frac{3}{2}}b - ab^{\frac{3}{2}} - b^{\frac{3}{2}}}$. Ans.

$$\begin{array}{r} (2x^3 + 3x^2 - 4x + 1 \\ 3x^2 + 2x - 4)\overline{6x^5 + 13x^4 - 14x^3 - 17x^2 + 18x - 4} \\ 6x^5 + 4x^4 - 8x^3 \\ \hline 9x^4 - 6x^3 - 17x^2 \\ 9x^4 + 6x^3 - 12x^2 \\ \hline - 12x^3 - 5x^2 + 18x \\ - 12x^3 - 8x^2 + 16x \\ \hline 3x^2 + 2x - 4 \\ 3x^2 + 2x - 4 \end{array}$$

∴ Quotient = $\underline{2x^3 + 3x^2 - 4x + 1}$. Ans.

2. Resolve into elementary factors—

(1.) $a^4 - b^4$. (2.) $15x^2 + x - 84$;

and prove that $(2a - b)^4 - (a - 2b)^4 = 15(a + b)(a - b)^3\left(1 + \frac{2ab}{5(a-b)^2}\right)$.

(1.) $a^4 - b^4$
$= (a^2 - b^2)(a^2 + b^2)$
$= \underline{(a + b)(a - b)(a^2 + b^2)}$. Ans.

(2.) $15x^2 + x - 84$.

Choose factors of 15, say 5 and 3, and factors of 84, say 12 and 7, and place them thus :—

$$\begin{array}{ccc} 5 & \times & 12 \\ 3 & \times & 7 \end{array}$$

The sign of 84 shows that we must subtract the cross products, and the difference must be one, the co-efficient of the middle term.

$5 \times 7 = 35$ and $3 \times 12 = 36$.

∴ As the middle term is positive the sign of 12 must be positive.

∴ Factors = $\underline{(5x + 12)(3x - 7)}$. Ans.

$(2a - b)^4 - (a - 2b)^4$
$= [(2a - b)^2 + (a - 2b)^2][(2a - b)^2 - (a - 2b)^2]$
$= (4a^2 - 4ab + b^2 + a^2 - 4ab + 4b^2)$
$\quad (2a - b + a - 2b)(2a - b - a + 2b)$
$= (5a^2 - 8ab + 5b^2)(3a - 3b)(a + b)$
$= 3(a + b)(a - b)(5a^2 - 8ab + 5b^2)$
$= 3(a + b)(a - b)[(5a^2 - 10ab + 5b^2) + 2ab]$
$= 3(a + b)(a - b)[5(a - b)^2 + 2ab]$
$= 3(a + b)(a - b) \times 5(a - b)^2\left\{1 + \frac{2ab}{5(a - b)^2}\right\}$
$= 15(a + b)(a - b)^3\left(1 + \frac{2ab}{5(a - b)^2}\right)$.

3. If $A = pB + C$; $B = qC + D$; $C = rD$; show that D is a common measure of A and B.

Find the G. C. M. of $34(3x^3 - 8x^2y + 5xy^2 - 2y^3)$ and $51(x^3 - 4x^2y + 7xy^2 - 6y^3)$.

$B = qC + D$
$= qrD + D$
$= D(qr + 1)$.
∴ D is a measure of B.

$A = pB + C$
$= pD(qr + 1) + rD$
$= D(pqr + p + r)$.
∴ D is a measure of A.

Wherefore D is a common measure of A and B.

$$\begin{array}{r} x^3 - 4x^2y + 7xy^2 - 6y^3)\overline{3x^4 - 8x^3y + 5xy^3 - 2y^4}(3 \\ 3x^4 - 12x^3y + 21xy^2 - 18y^3 \\ \hline 4y \mid 4x^3y - 16xy^2 + 16y^3 \\ x^3 - 4xy + 4y^2 \end{array}$$

$$\begin{array}{r} x^3 - 4xy + 4y^2)\overline{x^3 - 4x^2y + 7xy^2 - 6y^3}(x \\ x^3 - 4x^2y + 4xy^2 \\ \hline 3y^2 \mid 3xy^2 - 6y^3 \\ x - 2y \end{array}$$

$$\begin{array}{r} x - 2y)\overline{x^2 - 4xy + 4y^2}(x - 2y \\ x^2 - 2xy \\ \hline - 2xy + 4y^2 \\ - 2xy + 4y^2 \end{array}$$

G. C. M. of 34 and 51 = 17.
∴ G. C. M. = $\underline{17(x - 2y)}$. Ans.

4. *Prove* that $\frac{a}{b} \div c = \frac{a}{bc}$, where the letters denote *any* numbers.

Simplify—

$$\left(\frac{a^2 + ab + b^2}{a^3 + b^3} - \frac{a^2 - ab + b^2}{a^3 - b^3}\right) \div (a^4 - a^2b^2 - b^4).$$

To prove that $\frac{a}{b} \div c = \frac{a}{bc}$.

In $\frac{a}{bc}$ the unit has been divided into c times as many equal parts as it has been in $\frac{a}{b}$; and the same number of parts is taken in both cases.

$\therefore \underline{\frac{a}{b} \div c = \frac{a}{bc}}$.

$$\left(\frac{a^2 + ab + b^2}{a^3 + b^3} - \frac{a^2 - ab + b^2}{a^3 - b^3}\right) \div (a^4 - a^2b^2 - b^4)$$
$$= \left[\frac{a^2 + ab + b^2}{(a + b)(a^2 - ab + b^2)} - \frac{a^2 - ab + b^2}{(a - b)(a^2 + ab + b^2)}\right] \div (a^4 - a^2b^2 - b^4)$$
$$= \frac{(a - b)(a^2 + ab + b^2)^2 - (a + b)(a^2 - ab + b^2)^2}{a^6 - b^6} \div (a^4 - a^2b^2 - b^4)$$

$$= [(a-b)(a^4 + 2a^3b + 3a^2b^2 + 2ab^3 + b^4) - (a+b)(a^4 - 2a^3b + 3a^2b^2 - 2ab^3 + b^4)] \div (a^6 - b^6)(a^4 - a^2b^2 - b^4)$$

$$= (a^5 + a^4b + a^3b^2 - a^2b^3 - ab^4 - b^5 - a^5 + a^4b - a^3b^2 - a^2b^3 + ab^4 - b^5) \div (a^6 - b^6)(a^4 - a^2b^2 - b^4)$$

$$= (2a^4b - 2a^2b^3 - 2b^5) \div (a^6 - b^6)(a^4 - a^2b^2 - b^4)$$

$$= 2b(a^4 - a^2b^2 - b^4) \div (a^6 - b^6)(a^4 - a^2b^2 - b^4)$$

$$= \frac{2b}{a^6 - b^6}$$ Ans.

5. The square root of a rational quantity cannot be partly rational and partly a quadratic surd.

Find the square root of $32 - 10\sqrt{7}$.

If possible let $\sqrt{n} = a + \sqrt{m}$; then by squaring these equal quantities $n = a^2 + 2a\sqrt{m} + m$;

thus $2a\sqrt{m} = n - a^2 - m$,

and $\sqrt{m} = \frac{n - a^2 - m}{2a}$,

a rational quantity, which is contrary to the supposition.

Suppose $\sqrt{32 - 10\sqrt{7}} = \sqrt{x} - \sqrt{y}$,

Squaring] $32 - 10\sqrt{7} = x - 2\sqrt{xy} + y$,

Hence $x + y = 32$, (1)

$$2\sqrt{xy} = 10\sqrt{7}$$

$$4xy = 700;$$

$$(x+y)^2 - 4xy = 1024 - 700$$

$$(x-y)^2 = 324$$

$$\therefore x - y = 18; \quad (2)$$

From (1) and (2), $x = 25$, and $y = 7$.

$$\therefore \sqrt{32 - 10\sqrt{7}} = 5 - \sqrt{7}.$$

6. Solve the equations—

(1.) $\frac{3x-25}{7} - \frac{33-x}{10} + \frac{8x-41}{21} = \frac{8x+1}{35}$.

(2.) $\frac{2x}{x-4} + \frac{2x-5}{x-3} = 8\frac{1}{3}$.

(1.) $\frac{3x-25}{7} + \frac{33-x}{10} + \frac{8x-41}{21} = \frac{8x+1}{35}$

$$90x - 750 - 693 + 21x + 80x - 410 = 48x + 6$$

$$90x + 21x + 80x - 48x = 6 + 750 + 693 + 410$$

$$143x = 1859$$

$$\therefore x = 13.$$

(2.) $\frac{2x}{x-4} + \frac{2x-5}{x-3} = 8\frac{1}{3}$

$$\frac{2x(x-3) + (x-4)(2x-5)}{(x-4)(x-3)} = \frac{25}{3}$$

$$3(2x^2 - 6x + 2x^2 - 13x + 20) = 25(x-4)(x-3)$$

$$3(4x^2 - 19x + 20) = 25(x^2 - 7x + 12)$$

$$12x^2 - 57x + 60 = 25x^2 - 175x + 300$$

$$25x^2 - 12x^2 + 57x - 175x = 60 - 300$$

$$13x^2 - 118x = -240$$

$$x^2 - \frac{118x}{13} = -\frac{240}{13}$$

$$x^2 - \frac{118x}{13} + \left(\frac{59}{13}\right)^2 = \frac{3481}{13^2} - \frac{240}{13}$$

$$= \frac{3481 - 3120}{13^2}$$

$$= \frac{361}{13^2}$$

$$x - \tfrac{59}{13} = \pm \tfrac{19}{13}$$

$$\therefore x = \tfrac{59}{13} \pm \tfrac{19}{13}$$

$$= 6, \text{ or } \tfrac{40}{13}.$$

7. A boy has three hours at his disposal: how far may he travel in a coach at the rate of nine miles an hour, so as to return home in time, walking back at the rate of three miles an hour?

Let x = distance in miles,

then, $\frac{x}{9} + \frac{x}{3} = 3$

$$x + 3x = 27$$

$$4x = 27$$

$$\therefore x = 6\tfrac{3}{4}.$$

$\therefore$ Distance = $6\frac{3}{4}$ miles. Ans.

8. What is meant by the abbreviation 'an *infinite* geometrical progression'?

If S be the sum of the squares, and S_1 the square of the sum, of the terms of an infinite geometrical progression, r being the common ratio; $S : S_1 :: 1 - r : 1 + r$.

An infinite geometrical progression means, when r is less than unity, that by taking n large enough, we can make ar^n less than any assignable quantity, and so treat it as zero, and the sum $= \frac{a}{1-r}$.

The sum never actually reaches that value however great the number of terms, but approaches nearer and nearer to it the more terms we take, and hence when the number of terms is indefinitely increased the sum is indefinitely near to $\frac{a}{1-r}$.

G.P. $= a, ar, ar^2, ar^3, \ldots$ to infinity,

squares of G.P. $= a^2, a^2r^2, a^2r^4, a^2r^6, \ldots$ to infinity,

$\therefore$ First term $= a^2$

Common ratio $= r^2$

Sum to infinity $= \frac{a^2}{1-r^2}$.

$$\therefore S : S^1 :: \frac{a^2}{1-r^2} : \left(\frac{a}{1-r}\right)^2$$

$$:: \frac{a^2}{(1+r)(1-r)} : \frac{a^2}{(1-r)(1-r)}$$

$$:: \frac{1}{1+r} : \frac{1}{1-r}$$

$$:: 1 - r : 1 + r.$$

9. Prove that a ratio of greater inequality is diminished by adding the same quantity to both its terms.

Two numbers are in the ratio 8 : 3, and if 21 be added to each, they are in the ratio 25 : 12. Find them.

In the ratio $a : b$, let a be greater than b.

Adding x to both terms, then

$a + x : b + x$ is less than $a : b$,

if $\frac{a+x}{b+x}$ be less than $\frac{a}{b}$,

if $\frac{b(a+x)}{b(b+x)}$ be less than $\frac{a(b+x)}{b(b+x)}$,

if $\frac{ab + bx}{b^2 + bx}$ be less than $\frac{ab + ax}{b^2 + bx}$,

if $ab + bx$ be less than $ab + ax$,

if bx be less than ax,

if b be less than a,

Now b is less than a;

$\therefore a + x : b + x$ is less than $a : b$.

Let $8x$ and $3x$ denote the numbers;

Then, $\frac{8x+21}{3x+21} = \frac{25}{12}$

$$96x + 252 = 75x + 525$$

$$96x - 75x = 525 - 252$$

$$21x = 273$$

$$\therefore x = 13.$$

$\therefore$ Nos. = 104 and 39. Ans.

10. Solve the equations:—

(1) $\begin{cases} 96x + 75y = 102 \\ 92x + 80y = 101 \end{cases}$

(2) $\begin{cases} x^2 + xy = 66 \\ x^2 - y^2 = 11 \end{cases}$

(1) $\left.\begin{matrix} 96x + 75y = 102 \\ 92x + 80y = 101 \end{matrix}\right\}$

$$\left.\begin{matrix} 1536x + 1200y = 1632 \\ 1380x + 1200y = 1515 \end{matrix}\right\}$$

$$156x = 117$$

$$\therefore x = \tfrac{117}{156}$$

$$= \tfrac{3}{4}.$$

$$75y = 102 - 96 \times \tfrac{3}{4}$$

$$= 102 - 72$$

$$= 30$$

$$\therefore y = \tfrac{30}{75}$$

$$= \tfrac{2}{5}.$$

$\therefore x = \frac{3}{4}$ and $y = \frac{2}{5}$. Ans.

(2) $\left.\begin{aligned} x^2 + xy &= 66 \\ x^2 - y^2 &= 11 \end{aligned}\right\}$

$\left.\begin{aligned} 2x^2 + 2xy &= 132 \\ x^2 - y^2 &= 11 \end{aligned}\right\}$

$x^2 + 2xy + y^2 = 121$

$\therefore x + y = \pm 11.$

$x(x + y) = 66$

$\therefore x = 66 \div \pm 11$

$= \pm 6.$

$x + y = \pm 11$

$\therefore y = \pm 5.$

$\therefore x = \pm 6$ and $y = \pm 5.$ Ans.

Mensuration.

$\pi = \frac{22}{7}$.

1. Find, to one place of decimals, the radius of a circle whose area is equal to that of a rhombus whose shorter diagonal is 120 feet and side 229 feet.

The diagonals of a rhombus bisect each other at right angles.

$\therefore$ $\frac{1}{2}$ longer diagonal $= \sqrt{229^2 - 60^2}$

$= \sqrt{52,441 - 3,600}$

$= \sqrt{48,841}$

$= 221$ ft.

$\therefore$ Area of rhombus $= (221 \times 120)$ sq. ft.

$= 26,520$ sq. ft.

Area of circle $=$ Radius$^2 \times \frac{22}{7}$;

$\therefore$ Radius$^2 \times \frac{22}{7} = 26,520$ sq. ft.

Radius$^2 = \left(26,520 \times \frac{7}{22}\right)$ sq. ft.

$= \frac{185640}{11}$ sq. ft.

$= 8,438{\cdot}18$ sq. ft.

8438·18(91·8
81
581 | 338
181
1828 | 15718
14624
1094

$\therefore$ Radius $= 91{\cdot}8$...feet. Ans.

2. The sides of a triangle are in the ratio of 15, 28, 41, and the perimeter is 1,428 feet: express its area as the fraction of an acre.

$15 + 28 + 41 = 84$;

$1,428 \div 84 = 17$;

$\therefore$ Sides $= (17 \times 15)$ ft., (17×28) ft. (17×41) ft. :

$\frac{1}{2}$ sum of sides $= \frac{1}{2}[17 \times (15 + 28 + 41)]$

$= \frac{1}{2}(17 \times 84)$

$= 17 \times 42$;

$\therefore$ Area $= \sqrt{\{(17 \times 42)[17 \times (42 - 15)][17 \times (42 - 28)][17 \times (42 - 41)]\}}$

$= \sqrt{17 \times 42 \times 17 \times 27 \times 17 \times 14 \times 17}$

$= 17^2\sqrt{14 \times 3 \times 9 \times 3 \times 14}$

$= (289 \times 14 \times 9)$ sq. ft,

$= (289 \times 14)$ sq. yds.

$= \frac{289 \times 14}{4840}$ acre

$= \frac{1011}{1210}$ acre. Ans.

3. Find approximately the cost of boarding an hexagonal floor whose side is 24 feet, at 10d. per square yard.

Area of hexagon $=$ Area of 6 equal equilateral triangles.

Height of each triangle $= \sqrt{24^2 - 12^2}$ ft.

$= 12\sqrt{2^2 - 1^2}$ ft.

$= 12\sqrt{3}$ ft.;

Area of floor $= (6 \times 12 \times 12\sqrt{3})$ sq. ft.

$= 96\sqrt{3}$ sq. yds.;

$\therefore$ Cost of boarding $= (96\sqrt{3} \times 10)$d.

$= (\sqrt{96^2 \times 3} \times 10)$d.

$= (\sqrt{27648} \times 10)$d.

27648(166·276
1
26 | 176
156
326 | 2048
1956
3322 | 9200
6644
33247 | 255600
232729
332546 | 2287100
1905276
291824

$= 1,662{\cdot}76$d.

$= 138$s. $6\frac{3}{4}$d.,

$= £6$ 18s. $6\frac{3}{4}$d. Ans.

Male Candidates.

FIRST YEAR.

Euclid.

THREE *hours allowed for this Paper.*

Candidates are not allowed to answer more than EIGHT *questions.*

Capital letters (*excluding A, B, C, D, E, F*), not numbers, must be used in the diagrams.

All generally understood abbreviations and symbols for *words* may be used, but not symbols of *operation*, such as $-$, $+$, $\times$, PQ^2, PQ . RS.

1. Define *plane, angle, figure, parallelogram, postulate, axiom.*

If two angles of a triangle be equal to one another, the sides also which subtend, or are opposite to the equal angles, shall be equal to one another.

A *postulate* is a problem, the possibility of which is admitted to be self-evident, and to require no proof.

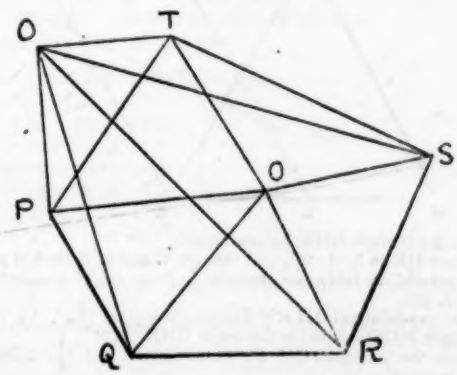
An *axiom* is a self-evident truth, which cannot be rendered more evident by demonstration; or, an axiom in Geometry is a theorem, the truth of which is admitted without proof.

Book I., Proposition 6.

2. Any two sides of a triangle are together greater than the third side.

The sum of the distances of any point from the angular points of a pentagon is greater than half the sum of the sides.

Book I., Proposition 20.



Let PQRST be a pentagon, and O any point, either within or without the pentagon.

Then the sum of the distances of O from the angular points of PQRST shall be greater than half the sum of the sides of PQRST.

Draw OP, OQ, OR, OS, OT. (Post. 1.)

Proof.—The two sides OP, OQ, are greater than PQ, (I. 20.)
the two sides OQ, OR > QR,
" " OR, OS > RS,
" " OS, OT > ST,
" " OT, OP > TP;
therefore twice OP, OQ, OR, OS, OT are together greater than PQ, QR, RS, ST, TP;

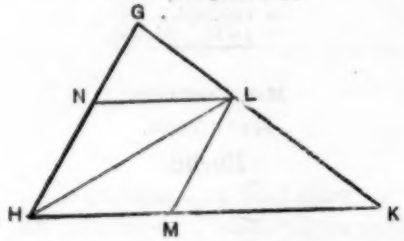
Wherefore the sum of the distances of O from the angular points of PQRST is greater than half the sum of the sides of PQRST.

Q. E. D.

3. The opposite sides and angles of a parallelogram are equal to one another, and the diameter bisects it, that is, divides it into two equal parts.

Inscribe a rhombus in a triangle with one angle coincident with an angle of the triangle, and the opposite angle on a side of the triangle.

Book I., Proposition 34.



Let GHK be the given triangle, and let the angle GHK be the coincident angle.

Construction.—Bisect the angle GHK by the straight line HL (I. 9), meeting GK in L.

Through L draw LM, LN parallel to GH, HK, respectively (I. 31).

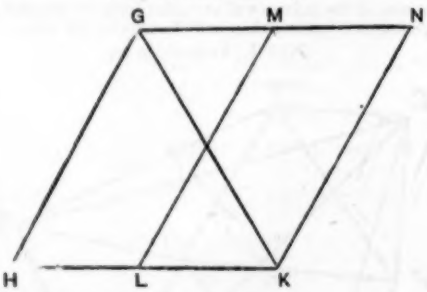
Then NHML shall be the rhombus required.

Proof.—The quadrilateral NHML is a parallelogram (Def.A.).
∴ LM = NH and NL = HM; (I. 34.)
Angle MHL = angle NHL (Con.)
= angle MLH, (I. 29.)
∴ side ML = side MH. (I. 6.)
Wherefore the figure NHML is equilateral, and is therefore a rhombus, as its angles are not right angles. Q. E. F.

4. To describe a parallelogram that shall be equal to a given triangle, and have one of its angles equal to a given angle.

If the triangle be equilateral, and the given angle equal to an angle of the triangle, the perimeters are likewise equal.

Book I., Proposition 42.



Let the triangle GHK be equilateral.

Bisect HK in L (I. 10), and through L and K draw LM and KN parallel to GH, and through G draw GMN parallel to HK (I. 31).

The quadrilateral MLKN is a parallelogram (Def. A), and the angle MLK is equal to the angle GHK (I. 29).

Then the perimeters of the parallelogram and the triangle shall be equal.

Proof.—The sides ML and NK are each equal to GH, or a side of the equilateral triangle (I. 34); also LK is half of HK, therefore MN and LK are together equal to a side of the triangle; wherefore the perimeters of the parallelogram MLKN and the equilateral triangle GHK are equal.

Q. E. D.

5. If a straight line be divided into two equal parts, and also into two unequal parts, the rectangle contained by the unequal parts, together with the square on the line between the points of section, is equal to the square on half the line.

Show also that the squares on the two unequal parts are together equal to twice the rectangle contained by those parts, together with four times the square on the line between the points of section.

Book II., Proposition 5.

Let the straight line PQ be divided into two equal parts in the point R, and into two unequal parts in the point S.

Then the squares on PS and SQ shall be equal to twice the rectangle contained by PS, SQ, and four times the square on RS.

Proof.—The square on PQ = squares on PS and SQ and twice the rect. PS, SQ (II. 4).

But square on PQ = 4 times square on RQ, and square on RQ = rect. PS, SQ, and square on RS (II. 5).

Therefore squares on PS and SQ and twice rect. PS, SQ = 4 times rect. PS, SQ, and 4 times square on RS (Ax. 1).

Wherefore squares on PS and SQ = twice rect. PS, SQ, and 4 times square on RS (Ax. 3). Q. E. D.

6. To describe a square that shall be equal to a given rectilineal figure.

Divide algebraically a given line into two parts so that their rectangle may be equal to a given square. Explain the two values, and show from your result that the problem is only possible when the side of the square is not greater than half the given line.

Book II., Proposition 14.

Let the given line contain a linear units, and the side of the given square b linear units.

Let one of the unknown parts contain x units;

then the other part contains $(a - x)$ units.

$$\therefore \quad x(a-x) = b^2$$
$$ax - x^2 = b^2$$
$$x^2 - ax = -b^2$$
$$x^2 - ax + \left(\frac{a}{2}\right)^2 = \frac{a^2}{4} - b^2$$
$$= \frac{a^2 - 4b^2}{4}$$
$$x - \frac{a}{2} = \frac{\pm\sqrt{a^2 - 4b^2}}{2}$$
$$\therefore \quad x = \frac{a \pm \sqrt{a^2 - 4b^2}}{2}.$$

The two values represent the two parts into which the given line is divided, as

$$\frac{a + \sqrt{a^2 - 4b^2}}{2} + \frac{a^2 - \sqrt{a^2 - 4b^2}}{2} = \frac{2a}{2} = a.$$

As the problem is only possible when $(a^2 - 4b^2)$ is positive, as we cannot take the square root of a negative quantity,

∴ It is only possible when

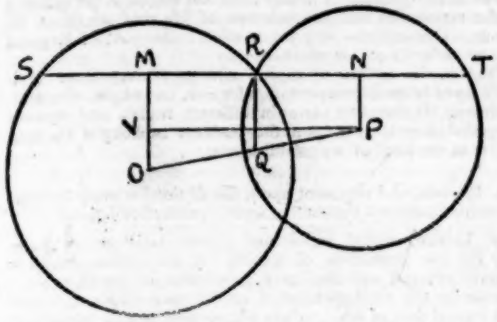
$$a^2 > 4b^2, \text{ or } a^2 = 4b^2,$$
$$a > 2b, \text{ or } a = 2b,$$
$$\frac{a}{2} > b, \text{ or } \frac{a}{2} = b,$$

or when the side of the square is not greater than half the given line.

7. If a straight line drawn through the centre of a circle bisect a straight line in it which does not pass through the centre, it shall cut it at right angles; and if it cut it at right angles it shall bisect it.

Draw through one of the points of section of two intersecting circles a straight line terminated in the circumferences and bisected at that point.

Book III., Proposition 3.

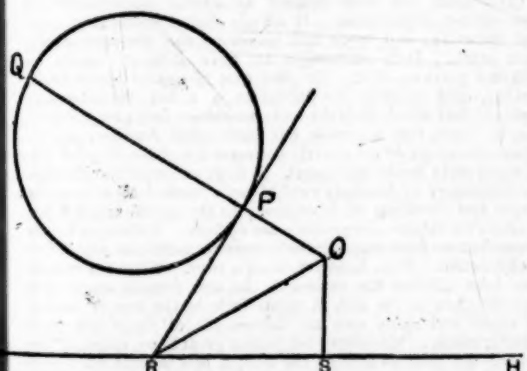


Let O and P be the centres of two unequal circles.
Join OP, and bisect it in Q (I. 10).
Join Q with R one of the points of intersection.
Through R draw SRT at right angles to QR (I. 11), and terminated by the circles at S and T.
Then ST shall be the line required.
Draw the perpendiculars OM, PN (I. 12), and PV at right angles to OM.

Proof.—Because OP is bisected in Q, and OM is drawn parallel to QR, therefore QR bisects VP, as a line drawn through the middle point of one side of a triangle parallel to the base bisects the other side.
Consequently MN, which is parallel to VP, is bisected in R.
But SR is double of MR, and RT is double of RN (III. 3);
∴ SR = RT.
Q. E. F.

8. If a straight line touch a circle, the straight line drawn from the centre to the point of contact shall be perpendicular to the line touching the circle.
Describe a circle which shall touch a given circle at a given point, and shall also touch a given straight line.

Book III., Proposition 18.



Let P be the given point in the given circle, and let GH be the given straight line.

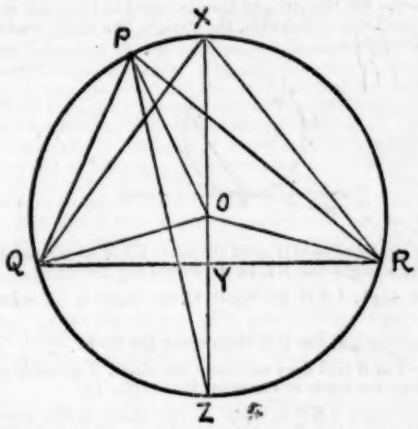
Construction.—Draw the diameter PQ, and draw PR at right angles to PQ, cutting GH in R (I. 11).
Bisect the angle PRH by the straight line RO, cutting QP produced in O.
Then O shall be the centre of the circle required.
Draw OS perpendicular to GH.

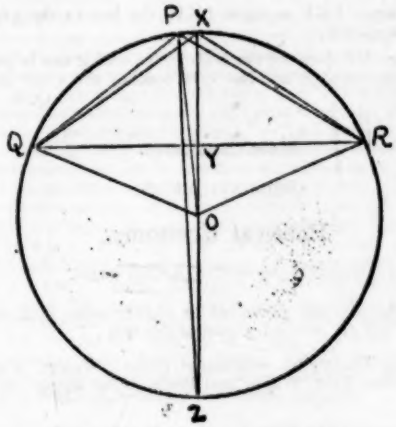
Proof.—In the triangles POR, SOR,
angle PRO = angle SRO (Con.),
angle OPR = angle OSR (Ax. 11),
and side OR is common,
∴ OP = OS. (I. 26).
The angles at P and S are right angles;
∴ The circle described from the centre O with the radius OP or OS touches the given circle at the point P and the given straight line at the point S. (III., 16, Cor.).
Q. E. F.

9. The angle at the centre of a circle is double of the angle at the circumference on the same base, that is, on the same arc.

PQR is a triangle inscribed in a circle, XYZ a diameter cutting QR at right angles at Y: show that the difference of the angles at Q and R is double of the angle XZP or PXZ according as the centre lies in XY or YZ.

Book III., Proposition 20.





Bisect XZ in O; then O is the centre of the circle.
Join OP, OQ, OR, and XQ, XR.

Proof.—QR is bisected in Y (III., 3).
Then XQ = XR (I. 4),
$\left.\begin{array}{l}\angle \text{POR} = \text{twice } \angle \text{PQR} \\ \angle \text{POQ} = \text{twice } \angle \text{PRQ}\end{array}\right\}$ (III., 20).
∴ Difference between the angles at Q and R = half the difference between the angles POR, POQ;
∠ XOQ = ∠ XOR (I., 8),
and ∠ XOQ = ∠ POQ and ∠ POX,
∠ XOR = ∠ POR less ∠ POX;
∴ Difference between angles POR, POQ = twice angle POX;

But difference between the angles at Q and R = half the difference between the angles POR, POQ, that is, = the angle POX; but the angle POX = twice angle XZP.

∴ Difference between the angles at Q and R is double of the angle XZP. Q. E. D.

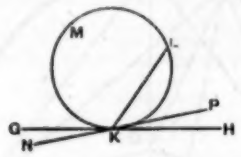
Note.—It is evident that the angle PXZ is an error, as the angle POX is double of the angle XZP in both figures, the angle PXZ being half the angle POZ, which is considerably greater than either the angles at Q or R.

10. If a straight line touch a circle, and from the point of contact a straight line be drawn cutting the circle, the angles which this line makes with the line touching the circle shall be equal to the angles which are in the alternate segments.

State and demonstrate the converse of this proposition.

Book III., Proposition 32.

Converse.—If a straight line meet a circle, and from the point of meeting a straight line be drawn cutting the circle, and the angle between the two straight lines be equal to the angle in the alternate segments of the circle, the straight line which meets the circle shall touch it.



Let the straight line GH meet the circle KLM at the point K, and let the straight line KL be drawn cutting the circle.

Let the angle LKH be equal to the angle in the segment KLM.

Then the straight line GH shall touch the circle.

Proof.—For if GH does not touch the circle, if possible draw NP touching the circle at the point K. (III., 17.)

Then the angle LKP is equal to the angle in the segment KLM III. (32); but the angle LKH is equal to the angle in the same segment (Hyp.)

∴ The angle LKP = angle LKH, the less to the greater, which is impossible.

Wherefore NP does not touch the circle, and it can be proved that no other straight line but GH touches the circle at the point K. Q. E. D.

Male Candidates.

SECOND YEAR.

Political Economy.

THREE *hours allowed for this paper.*

Candidates are not permitted to answer more than EIGHT questions, and are advised to answer the *last*.

1. Define briefly the economical terms: Wealth, Capital, Value, Utility, Rent, Wages, and Profit. Give simple illustrations.

(1) *Wealth* may be defined as that which has exchange value, as meat, tools, coal.

Capital is that part of wealth which is appropriated to reproductive employment, that is to the production of more wealth. Gunpowder used for blasting in a mine would be productively employed, and would therefore be capital. It would not be capital if used for amusement, as on fireworks, or for destructive purposes, as in war.

Value may mean value in use or value in exchange. If it is used in the first sense it means useful and desirable, as when we say iron and lead are very useful commodities, or that coal is more valuable than gold. If it is used in the other sense it stands for exchange value, and means how much of one commodity will be given in exchange for a certain quantity of another. It therefore implies a ratio.

Utility is used by Jevons to stand for desirability. It has the meaning of value in the first sense, as previously defined.

Rent is that share of the produce which goes to the owner of the natural agents, such as land, mines and fisheries. Instead of cultivating land, working mines, or conducting fishing operations, the owners of these usually let other persons do so upon their undertaking to pay certain sums annually. The money paid is rent. No doubt it often includes a portion of interest for the capital which has been fixed on the recovery or improvement of the property which is rented.

Wages is that share of the wealth produced which goes to remunerate the labourers. The nominal wage may be said to consist in the quantity of money; the real wages, in the quantity of the necessaries and conveniences of life that are given for labour. This explains why 30s. a week in one part of England may go as far as 40s. in another.

Profit is the reward of capital and its management. It is made up of interest, compensation for risk, and wages of superintendence. It therefore varies in different trades, and depends in special cases largely upon the business capacity of the man who is at the head of an establishment.

2. Explain, and comment upon, the distinction made by some economists between Productive and Unproductive labour.

(2) Labour, capital, and natural agents (land) are all necessary for the production of wealth. If we confine wealth to material objects, and thus take production of wealth to mean practically the multiplication of useful commodities, it is plain that a good deal of what we are accustomed to call labour does not result directly in the increase of useful things. The labour which goes directly to multiply the number of useful commodities has been called productive, that which does not has been called unproductive. Thus a shoemaker is a productive labourer, and the food he consumes is productively consumed, while a soldier or a professional bowler labours unproductively. This distinction is less instructive than it may at first appear, inasmuch as it is not possible to divide all labour into productive and unproductive. A carpenter is no doubt a productive labourer if he works at his trade, but what is he if he gives elementary instruction to senior boys in the use of tools? Are temperance lecturers, or even professional musicians, working unproductively, if by their exertions men become more sober and healthy and refined. The value of much work depends upon the taste and fidelity of those who produce it. Can they be said to be unproductively engaged who help to develop these qualities, even though they do so indirectly? If the terms are retained it would be better to extend the meaning of the word productive, so that it shall include all those who in any way directly or indirectly tend to increase the quantity and quality of useful commodities.

3. Point out the effects of a large and rapid transfer from the Circulating (or Remuneratory) to the Fixed (or Auxiliary) capital of a country.

(3) Capital has been defined as wealth appropriated to reproductive employment. It affords shelter, protection, tools and materials, and feeds and maintains the labourers during their work. It is convenient to have different names for different portions of it. So that part of capital which feeds, clothes, and protects the labourers is called Remuneratory capital; that which finds the tools, machines, factories, railways, canals, roads, raw materials has been called Auxiliary capital. These meanings do not exactly correspond to those given by Mill to Fixed and Circulating capital. A large and rapid transfer from Remuneratory to Auxiliary capital has a marked effect upon the wages and condition of labourers. In the actual transfer new markets for labour and produce are opened. Labourers betake themselves to fresh employments; certain industries are abnormally active. This, however, is soon over. When the transfer has been effected the capital in the new form is much more durable than in the old, it wants little in the way of renewal or repair and many men are thrown out of work and much distress ensues. Machinery has been a great boon, railways have helped the poor as well as the rich, a new invention is always a thing to be welcomed; but it often happens that a special class may suffer and suffer severely from the sudden change in the way in which capital performs its function in regard to the multiplication of useful commodities. There is a good deal of reason among special classes of labourers for the antipathy they have exhibited to the introduction of machinery into trades which up to that time were conducted by manual labour. The question with the labourer is not only how much capital is sunk in an industry but also how often it is turned over.

4. How does division of Labour increase production? What, if any, limits are there to its applicability?

(4) In the production of wealth one of the objects to be attained is how to use a given amount of labour to the greatest advantage. Adam Smith, in a well-known passage, pointed out the advantages that arise from the division of labour or separation of employments. The first is the increased dexterity in the workman. By confining himself to a single operation a man acquires the maximum facility in doing it. No one becomes

a good blacksmith, glass-blower, coal-miner, or teacher, who did not begin early and continue at it for many years. The second was the saving in time. Time is lost by passing from one kind of work to another. Different tools may be necessary; the work may have to be done in different rooms; preliminary work may have been done to little purpose. Smith went on to say that they would be idling in the intervals. That is not certain. Much would depend as the moral character of the workmen. Smith's third advantage was likelihood of invention of machinery. Perhaps the more intimately a man is acquainted with any operation the more likely he is to see how it may be shortened by using some mechanical device. But invention depends more upon natural endowment than exclusiveness of occupation. Mr. Babbage pointed out a fourth advantage arising from the separation of employments—the economy there is in classifying men according to their capacity. It is best for society that each man should devote himself to what he can do best. He does more in the same time and he does it better. A farmer would find it desirable to have a man to look after the sheep, another to have charge of the horses, a third to superintend the growing of the crops. But it is plain that this would only be possible if his farm was large enough, say, to enable him to employ a shepherd. This suggests the limitation to the application of the division of labour. No commodity will be cheapened by the introduction of the division of labour unless there is a sufficient demand for the commodity to make it worth while for it to be produced on a large scale.

5. Show how the general rate of wages in a country would be affected, (*a*) by an extensive emigration of the labouring classes, (*b*) by the exportation of large amounts of capital.

(5) (*a*) It must be borne in mind that there are at present in this country what may be called non-competing groups of labourers. The direct effect of a decrease in the number of persons seeking employment is to make wages rise. But a decrease in the number of carpenters would not much affect the pay of engine-drivers; nor would an emigration of miners much benefit the agricultural labourers. Further, the groups which were not benefited by the decrease in their numbers would most likely be injured by the diminished demand for the commodities which they were engaged in producing.

(*b*) Large amounts of capital may be exported from a country like England without any bad effect upon general wages, or indeed any effect. Such money would be lying idle, seeking investment. In all probability it would not be employed in this country, at least for a time. So long as it lay in the bank, or became invested in Government securities, it would not affect wages. Much depends upon the condition of the country in question. If the country offered scope for new investments, like Canada and Australia, and if the money exported would otherwise have been used in starting and maintaining new industries at home, the effect of the export would have been to prevent a rise of wages which would otherwise have taken place. A large export of capital from England to some of the States in South America might lead to a large increase in their imports from this country, and an increased demand for our goods, and therefore a rise in the general wages of the country.

6. What are the advantages and disadvantages of the form of land tenure known as 'Peasant Proprietorship'? Mention some countries in which this system obtains.

(6) In the system called Peasant Proprietorship land, labour and capital are all united in one person, he is landlord, capitalist and labourer in himself. The advantage of a system of this sort is, that owing to the magic effect of having land of his own the peasant proprietor becomes intelligent (to a certain degree) independent and prudent. His life is one continuous struggle. His fare, if plentiful, is often coarse, his clothing is common and meagre, his home has few comforts and no luxuries. He has no time to read and none for recreation. But with these serious drawbacks he is thrifty, often parsimonious, temperate, fearless, and contented. The great economic objection to peasant proprietorship is, that the produce is small compared with that obtained on large farms, where there is capital enough to allow for high class farming and a division of labour.

Peasant Proprietorship is not likely to gain ground in Europe in the present day. For farming to pay it must be conducted in a business-like and almost scientific way. Capital must be found for the purchase of costly machinery, the application of manures and the employment of trained intelligence. All this is incompatible with peasant proprietorship. There are, however, a few things that need constant attention. For the growth of these, spade industry may still be retained. The quantity of fruit and vegetables imported into this country is still so large as to make it worth while to consider whether greater encouragement should not be given to labourers to settle down in favourable districts, instead of crowding into the towns, with the view of becoming peasant proprietors for supplying vegetables, milk and eggs to large towns.

7. What is meant by the Cost of Production of a commodity? Point out the elements of which it is made up.

(7) The cost of production may be said to consist of the efforts and abstinences required for producing it. In practice these are measured by their money value. The various sums that would have to be paid to make a commodity and bring it to market make up the expense of production. Take as an example, a pair of shoes. The cost of production would be the total of the sums paid for the materials and the workmanship and the expense of carriage and the remuneration of the person who exposed them for sale and actually sold them. The cost of production is thus made up of many items each liable to vary in the course of time. It is however the sum total of them that settles the price on the average for long periods. For if articles continued to sell below their cost of production they could not be made, and if they sold at prices much higher, profits in that special trade would be very high, the result being that others would enter into it and thus reduce the rate of profit by keen competition.

8. Suppose the Welsh gold mines, lately opened, should prove very productive, how would it affect (*a*) the prices of commodities generally, (*b*) the value of articles made of gold?

(8) If the Welsh gold mines lately opened should prove very productive, there would be at once a large addition to the annual out-put of gold. As price is merely exchange value expressed in terms of gold, anything which affects the exchange value of gold alters the prices of all other commodities at once, and in the same direction. Now the effect of a great increase in supply is always to lower the exchange value. The same quantity of gold would therefore exchange for a smaller quantity of all other things than formerly, and for the same quantity as before a greater amount of gold must be given; that is, there would be a general rise in prices. Articles made of gold would be a peculiar case. Price is value expressed in terms of gold. Gold cannot therefore be said to have a price in the sense that other commodities have it. It is merely expressing the value of a definite quantity of the commodity in terms of itself. The weight of a sovereign is fixed by law. Hence it can be said that gold is £3 17s. 10½d. per ounce. This only means that an English sovereign weighs nearly a quarter of an ounce troy (123·5 grains). Large additions of gold would not, therefore, at all affect the price of articles made of gold. If their price changed it would be on account of that part of their cost which was not due to the material of which they were made. As most things would become dearer, wages might rise, and hence gold ornaments might become dearer too, but not in the same ratio as ornaments made of other materials.

9. Because English imports largely exceed in value English exports, is it true that England is being impoverished by her foreign trade? Give what explanation you can of this excess in the value of our imports.

(9). It is a mistake to imagine that this country is being impoverished by its foreign trade, simply because the value of the imports is greatly in excess of its exports. The exchange against this country is technically said to be unfavourable under such circumstances. The English merchant has to pay a little more per cent for a bill. But this is a trifling matter, and does not at all imply that the result of the trade generally is bad. Our foreign trade enables us to get things which we want and in many cases could not get at home, or only at ruinous cost. In these instances it would suit us to continue to buy in foreign countries, even though we had to pay for our imports entirely in money. But such is by no means the case. From the peculiar relations we hold to other countries they would have to send us large sums of money annually if we did not export anything. Our imports must therefore exceed our exports. The fact is, we do more than half the carrying trade in the world. The freights and the merchants' profits are calculated at about seventeen or eighteen millions annually. England has lent money to almost all civilised countries. It has been calculated that we receive fifty millions a year from foreign investments.

Then there is the interest on our money invested in foreign trade, and the sums of money which foreigners spend on travel

in this country. These make up the main items of indebtedness of other nations to us over and above what they owe us for the goods we actually send to them. It is in this way that the great excess in the value of our imports is accounted for.

10. What is meant by Bi-metallism? Is our English monetary system bi-metallic, or not, and why?

(10.) Bi-metallism means that it is legal to pay our debts in either of two metals, generally in gold or silver. In this country we have not a double currency. We have all the advantages of a treble currency, but silver and copper coins are merely tokens. They are not exported; they remain in the country and serve for small change; nor is there any inducement to melt them down. The only currency in which debts of any amount can be legally discharged is gold or Bank of England notes. As a matter of fact copper and silver are readily taken; they are often much wanted, but they cannot be imposed upon a person who is unwilling to accept them. There has been a serious continued fall in the price of silver, and the bi-metallic movement is an effort to re-monetize silver.

11. Distinguish between Direct and Indirect taxation. Under which head would you class each of the following and why:—
(*a*) The House Duty; (*b*) The proposed Wheel Tax;
(*c*) The Tobacco Duty; and (*d*) Stamps on Receipts?

(11) A tax is direct when the person who really pays it, pays it himself and thus obtains a receipt for it; it is indirect when the person upon whom it really falls does not pay it himself, and does not get a receipt for it, some one else advancing it and recouping himself by an additional charge upon the taxed commodity.

The House Duty is a direct tax. The incidence is upon the tenant of the house. He pays it and gets no abatement in the rent from the landlord.

The incidence of the proposed Wheel Tax was direct.

The Tobacco Duty is an indirect tax. The person who uses the tobacco, of course, really pays the tax, but it is included in the cost of the tobacco. It is a tax he may escape if he likes. A direct tax is not optional, it is obligatory.

The Stamp upon a receipt is at the cost of the person who receives the money. It is a direct tax. It is true he gets no formal receipt from an official; but the tax is the stamp which he bought and had to deface.

Male and Female Candidates.

FIRST YEAR.

French.

Male Candidates may answer questions in *two* Languages; *Female* Candidates in *one* only.

TWO *hours allowed for this Paper for Male Candidates;* THREE *hours for Female Candidates.*

SECTION I.

Translate into English the following passages:—

(*a*) On comprend que, de toutes les nobles passions humaines, celle-là est la plus puissante parce qu'elle les contient toutes à la fois, et que, s'il y a dans l'histoire des efforts surnaturels à attendre de l'humanité, il faut les attendre du patriotisme.

(*b*) On lui enleva pendant son sommeil ses habits de femme, qu'elle avait revêtus en signe d'obéissance sur l'échafaud, et on la contraignit ainsi à reprendre ses habits d'homme, qui étaient à côté de son lit. A peine eut-elle revêtu par nécessité ce costume dont on faisait le signe de son crime et de son obstination, qu'on appela l'évêque pour la surprendre en récidive.

(*a*) It is clear that this is the most powerful of all the nobler human passions, because it includes them all at once, and that, if in the course of time any supernatural efforts are to be expected from humanity, they must be looked for in patriotism.

(*b*) They took away, whilst she was asleep, her woman's clothes which she had put on on the scaffold, as a token of obedience, thus compelling her to resume her man's clothes, which lay beside her bed. Scarcely had she clothed herself again under compulsion in this costume, which was made the mark of her crime and her stubbornness, than the bishop was called to surprise her in a repetition of her offence.

SECTION II.

Translate into French:—

1. After waiting some minutes in the train to allow the crowd of travellers to disperse, the queen, accompanied by the station-master, proceeded by a private door into the courtyard where a carriage was waiting for her. She got into it with her suite and her sister.

2. Be brave unto death.

3. There were no pens.

4. Sooner or later, death will overtake us all.

5. To-morrow morning he will be there.

(1) Après avoir attendu quelques minutes dans le train pour que la foule des voyageurs pût se disperser, la reine, accompagnée du chef de gare, entra dans la cour par une porte derobée, où une voiture l'attendait. Elle y monta avec sa suite et sa sœur.

(2) Soyez brave(s) jusqu' à la mort.

(3) Il n'y avait pas de plumes.

(4) Tôt ou tard la mort nous surprendra tous.

(5) Demain matin il sera là (il y sera).

SECTION III.

1. Parse, using French terms—
Il l'a achetée assez cher pour qu'elle soit brûlée.

2. Give the French for—
13, 31, 95th, 105, 200, 320, Janr 15th.

3. Give the feminines of *juif, blanc,* and the masculines of *vieille, coite;* and place accents on
legerete, fenetre, regle, depot, grele, gelee.

4. What are the nouns corresponding to the following adjectives:—*habile, épais, frais, vert, sec, long, empressé?*

5. Write out in the active voice, the future indicative of *joindre* and *s'habiller;* the present subjunctive of *prier;* and the subj. mood of *falloir.*

(1) *Il*—pronom personnel de la 3ième personne, masc., sing., sujet du verbe *acheter.*
l'—pronom personnel de la 3ième personne, fém., sing., régime direct du verbe *acheter* avec élision de l'*a.*
a—3ième pers., du sing., du prés., de l'indic., de l'auxiliaire *avoir.*
achetée—participe passé du verbe transitif et régulier *acheter,* fém., sing., s'accordant avec *l'* (*la*).
a achetée—3ième pers. du passé indéfini du verbe *acheter.*
assez—adverbe de quantité.
cher—adverbe de degré.
pour que—conjunction, demandant le subjonctif.
elle—pronom personnel de la 3ième personne, fém., sing., sujet du verbe *brûler.*
soit—3ième personne, du sing., du prés., du subj., de l'auxiliaire *être.*
brulée—participe passé du verbe transitif et régulier *brûler,* fém., sing., s'accordant avec *elle.*
soit brulée—3ième personne, du sing., du passé, du subj., du verbe *brûler.*

(2) Treize, trente-et-un, quatre-vingt-cinquième, cent cinq, deux cents, trois cent vingt, le quinze (de) Janvier.

(3) Juive, blanche, vieux (*vieil before a masc. noun beginning with vowel of mute h*) coi.
légèreté, fenêtre, règle, dépôt, grèle, gelée.

(4) Habileté, épaisseur, fraîcheur, verdure, sècheresse, longueur, empressement.

(5)

FUT. SIMPLE	FUT. PAST	
je joindrai	j'aurai	joint
tu joindras	tu auras	
il joindra	il aura	
nous joindrons	nous aurons	
vous joindrez	vous aurez	
ils joindront	ils auront	

FUT. SIMPLE	FUT. PAST.
je m'habillerai	je me serai habillé
tu t'habilleras	tu te seras ,,
il s'habillera	il se sera ,,
nous nous habillerons	nous nous serons habillés
vous vous habillerez	vous vous serez ,,
ils s'habilleront	ils se seront ,,

Pres. Subj.

que je prie
que tu pries
qu'il prie
que nous priions
que vous priiez
qu' ils prient

Subjunctive Mood

Present	*Imperfect*
qu'il faille	qu'il fallût
Past tense	*Pluperfect*
qu'il ait fallu	qu'il eût fallu

(To be continued.)

—o—

Practical Kindergarten Lessons for English Elementary Schools.

BY MRS. MORTIMER.

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I.

LIFE OF FRÖBEL.

Friedrich Fröbel, the founder of this system of education, was the son of a German clergyman. He was born at Oberweisbach, in Thuringia, on 21st April, 1782. His mother, a kind-hearted woman, died before he was twelve months old. His father, as clergyman of his place and the seven surrounding villages, was so much occupied that he had no time to look after his children, and hence they were left to the care of the servants. In 1786 his father married again, but this made things worse for Friedrich. There was no sympathy between him and his step-mother, and his father became very stern and harsh with him. Friedrich passed the greater part of his time like a prisoner, being compelled to keep within the boundary of his father's house and garden, and being denied the society of other children. This restraint, however, taught the lad to depend upon himself, and caused him to study closely the flowers, &c., of the garden. He was forced to appeal to nature for all he required, and it was undoubtedly this close communion with nature that developed his wonderful powers of observation and comparison, and led him later on to attach so much importance to its study. At the age of eleven years a new life commenced for him, for his uncle, the Rev. Hoffmann, a kind and gentle man, finding out the kind of life his nephew was leading, offered to take him and see to his education. His new home was quite the opposite to his former one. Here he found kindness, love and freedom reigning supreme. He now went to school and mixed with 40 children of his own age. He was allowed to roam about the country so long as he returned at a certain time. He soon became aware of the neglected state of his education and worked hard to recover the lost ground. Under the kind and fostering care of the schoolmaster he grew up strong in mind and body, and his thoughts became healthier and more sound.

After his confirmation he returned home, hoping to continue his studies at the university. His father however apprenticed him to a forester, who being very much occupied, left Friedrich to find out what he could for himself. Fröbel made good use of his time here and formed the acquaintance of a doctor, who introduced him into a new phase of society. At the end of his apprenticeship the forester was anxious to keep such a useful pupil, but Fröbel insisted on returning home, trusting that his father would now consent to his going to the university. On the condition that he should pay his own expenses out of his maternal inheritance, his father consented, and at the age of 18 Fröbel entered the university of Jena. Though he only lived for his study, and never joined in the pleasures of the other students, yet at the end of six months he found himself in debt. He wrote to his father for money, but that being denied, he was sent to prison because he could not pay his debts. He obtained his freedom by resigning his share in the property. On his release he returned home for a short time, and subsequently went to live with some relatives, where he studied practical farming. Some months after he returned home again on account of his father's illness, and now the father began to understand his son, and died blessing him. He was now 20½ years of age, and took a situation as forester at Bamberg, and afterwards went to Mecklenburg, as private secretary to a gentleman.

His uncle, who died in 1805, made him his sole heir. This supplied him with the means of living, and allowed him to do whatever he wished. On visiting Frankfort-on-Main, with the idea of becoming an architect, he became acquainted with a schoolmaster, named Grüner, who introduced him to several other teachers. He then commenced explaining his ideas on education, and Grüner, recognising in him a born governor and teacher, offered him a place in the new school he was then establishing. This school, arranged on the Pestalozzian plan, made a profound impression on Fröbel, and caused him to pay a visit to Pestalozzi and his school for teachers, where he was still further impressed with what he saw. He returned to Frankfort for two years, and at the end of that time he became tutor to three children. When 25 years old he settled on a farm with his three pupils, devoting his whole time to their education and to the development of his own educational ideas. The remembrance of his own unhappy childhood guided him to base his system on the healthy development of children by means of their love of self-activity and free, uninterrupted intercourse with nature. He considered that all scientific instruction should be relieved by and depend on judicious exercise and practical occupation.

He now commenced using his games, invented new kinds of bricks, and worked out the gradual progression for folding paper, cutting out cardboard, and plaiting paper. During all this time, however, he continued to think of Pestalozzi, and of the deficiencies in his own methods, and he persuaded the parents of his boys to allow him to take his pupils to Pestalozzi, at Yverdon, in Switzerland. We find him with this great educational reformer in 1808 as teacher and pupil, and we have his own words telling us how much he benefited under Pestalozzi. We next find him studying German and Natural History at the university of

Göttingen. Writing to his friends, he says, 'I was free, happy, healthy in mind and body, I was gay and contented.' In 1812 he went to the university of Berlin, and formed the acquaintance of several well-known teachers, two of whom — Millendorf and Langethal—afterwards became teachers in his school, and identified themselves with his work for the rest of their lives. In 1813, on the outbreak of war, he joined the army, not on account of enthusiasm for the war, but because he regarded the summons of the King of Prussia as an appeal to his duty, and his conscientiousness would not allow him to continue his studies when his fellow-students were enlisting as volunteers for the protection of their country. In 1814, at the end of the war, he accepted the post of Curator of Mineralogy at the Berlin Museum, where he continued his scientific studies, and still further developed his new educational theories, and, in his intercourse with the teachers of Berlin, he continued to expound his new system of education, especially to Millendorf and Langethal, who became his devoted followers.

His brother, a clergyman at Griesheim, had died and left two young children, and these Fröbel determined to take charge of and educate. He resigned his position at the museum and opened a school at Griesheim in Thuringia in November, 1816. Millendorf joined him and the school, though not a financial success, became too large for the place and was removed to a farm at Keilhau. There they were joined by Langethal, and the three educational enthusiasts worked on, though often nearly overwhelmed by financial failure. When in Berlin, Fröbel had made the acquaintance of a well-educated and wealthy lady, who shared his ideas of education. It was only the difference in their positions that had prevented Fröbel declaring his love, but as he could no longer do without a wife to look after his household, he wrote asking her to help him carry out his ideas. We find her joyfully giving up her comfortable house in Berlin to live with her husband in the country and to help him in his new undertaking. In spite of many difficulties and great opposition similar schools were started in connection with Keilhau. Owing however to the worry of his enemies we find him accepting the offer of a house in Lucerne. Here he also experienced great opposition, but was assisted by the government authorities, who sent young teachers to him to be trained. This new experience led him to notice that too much of the children's education was neglected before they came to him, and that for the children to receive the full benefits of his instruction it was necessary to attend to them at an earlier age; hence he concentrated his attention on a graduated system of instruction commencing almost from infancy. He tried to win over the mothers to help him in carrying out these ideas, and the result of this work was the formation of an association of families for the purpose of instructing the children from their earliest infancy in a school where there were proper occupations and games arranged for them.

In 1837 the first Kinder Garten was established at Blankenburg in Thuringia, not far from Keilhan. Another Kinder Garten was established at Frankfort-on-Main in 1848, and at Liebenstein, Thuringia, where he was then living, he established a school for training Kinder Garten teachers. Although Fröbel's undertakings continued to be financially unsuccessful, his educational system continued to gain many adherents and many schools were established to carry out his ideas. He arranged for a great meeting of prominent teachers at Liebenstein and showed them his institution and explained his methods to them. They became deeply interested, praised his work and promised him their active support. In the midst of these successes he met with a terrible reverse which might almost be said to have hastened his end, for in 1851 the establishment of Kinder Gartens was forbidden by the government of Prussia. This was owing to a book published by Carl Fröbel, a nephew of the great educationist, on girl schools and Kinder Gartens, and containing many socialistic ideas. Although Fröbel's system was thoroughly opposed to that advocated by his nephew he was unable to obtain any redress. In fact it was not till 1859 that the prohibition was withdrawn. While attending a Kinder Garten meeting at Gotha he took cold and died soon after, 21st July, 1852. He was buried at Scheveina in Thuringia, and a monument consisting of a ball, cylinder, and cube, was erected on his grave, bearing the inscription 'Let us live for our children,' which was one of his favourite sayings.

II.

Fröbel's remembrance of his own unhappy childhood seems to have given him a most earnest desire to make the school life of children as happy as possible, he therefore founded his system on children's love of activity, indeed throughout the children learn by *doing*, that is to say, it is during their occupation with the different materials that they gain information and have all their faculties developed and strengthened.

The term 'Kinder Garten' signifies 'Children's Garden.'—Here the school is likened to a garden and the children are the plants that have to be carefully trained and cultivated.

The various materials that Fröbel presents to the children he calls 'Gifts,' and the occupation or work that they do he calls 'play.' This last name has of course a charm for all children who will always work very much harder and with much more spirit when at play than at lessons.

It may be suggested by some, why should children have work given to them in the form of play!—we would answer such people by asking whether they do not like their work in the most pleasant form possible.

Is it not resonable, therefore, that little children should have their work in the most pleasing shape?

By this means a love of learning and a desire for information become imperceptibly a part of their nature.

Young children should not be allowed to feel the restraint of sitting still or standing for any length of time, and on no account should they be made to feel that a certain amount must be learnt before they are at liberty.

Many and agreeable changes are necessary for the healthy development of mind and body and the Kinder Garten supplies these changes by giving lessons under the name and in the form of play.

All Educationists who have tried this system of teaching young children have found that those taught by means of it learn more readily, and are much better able to use their hands for the work required of them in more advanced stages. It also proves beneficial

to them in after life, giving them habits of industry, neatness, order, and accuracy, and at the same time rendering them self-reliant, as each child has, from the beginning, had to do his own work. It cultivates the faculties of observation, perception, and invention; and also the power of language, for children are always encouraged to talk and made to describe the various objects that come under their notice. Teachers must admit the educational value of any system that will do this for young children, for we know that habits formed when we are young, whether good or bad, are those that cling to us through life. How careful therefore should we be in the training of the young. Mothers should exercise judgment in the choice of nurses, selecting such as are honest, upright women, and not such as would lead young children to deceive their parents in the least particular, for it is often this that is the beginning of untruthfulness and deceit. Even greater care should be exercised in the choice of those to whom the training of the young is to be entrusted.

It has often been urged that it is utterly impossible to teach Kinder Garten in the Elementary Infant School; but if teachers were to look upon Kinder Garten more as a *system* of teaching and less as a special branch of instruction they would understand the whole thing better and with very little thought be able to work it with great advantage in their schools. This will be readily seen by the following comparison—Every one has heard of special methods of teaching Reading, Writing, Arithmetic, and for imparting General Information, *e.g.*, by means of object lessons; and each one chooses his or her own special system and teaches by means of it. Now if the Infant Teacher would look upon the Kinder Garten as a special system by means of which she could teach Number, Form, Colour, Drawing, Elementary Reading, and also impart a great deal of General Information, besides cultivating the numerous faculties and qualities that have already been mentioned, the adoption of Kinder Garten would become more general. It is because teachers look upon it as something extra to be crammed into the already overcrowded work of the day that they have not taken more kindly to it, but when they see that it is really the most pleasant and therefore the simplest method of teaching so many subjects they will readily adopt it.

(To be continued.)

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How my School was Examined.

BY THE

HEAD TEACHER OF A LONDON SCHOOL.

In the Infant Department the children six years of age were classed in two divisions. In the first division the following tests were given in Arithmetic:—

A. (1) 18 + 47 + 50 + 9.
(1) 27 + 32 + 15 + 20.
(2) 61 − 40.
(4) 57 − 39.

B. (1) 25 + 14 + 36 + 10.
(2) 52 + 13 + 30 + 29.
(3) 64 − 18.
(4) 52 − 23.

Answers:—*A.* (1) 124; (2) 94; (3) 21; (4) 18. *B.* (1) 85; (2) 124; (3) 46; (4) 29.

The children then read from the Second Infant Reader in the Holborn Series. Questions were asked on coins, and on kindness to aged people. Recitations of simple poems were taken individually; and the examination included Action Songs and Musical Drill.

In the second division the following words were dictated: Men, Do, Gate, Fox, Man, Went, The, It, But, Upon, Fat, Duck, And, Hunt.

The Reading was from the Second Primer in the Holborn Series.

Questions were asked on the recitations, and the teacher gave a lesson on the Feet of Animals.

The Singing and Drill were the same as in the First Division.

Standard I.

Arithmetic.—(1) Add 53; 9; 700; 608; and 37.
(2) Take 81 from 603.
(3) From 502 take 9.

Answers:—(1) 1407; (2) 522; (3) 493.

Writing:—Ten words were dictated:—*Ears, Mice, Speak, Very, Faces, Many, Truth, Keys, Yards, Any.*

Standard II.

Arithmetic.—Two sets of sums were dictated:—*A.* (1) Add 909; 1,406; 5,942; 6,000; 3,300; and 5090.
(2) Take 186 from 15,000.
(3) Divide 8,795 by 11.
(4) 53,689 ÷ 3.
(5) 58,496 × 12.
B. (1) Multiply 740 by 260.
(2) Take 58 from 1,000.
(3) Add 109; 3,060; 58; 7,909; and 980.
(4) 17,004 ÷ 12.
(5) Divide 16,074 by 3.

Answers:—*A.* (1) 22,647; (2) 14,814; (3) 799 + 6; (4) 17,896 + 1; (5) 701,952.
B. (1) 192,400; (2) 942; (3) 12,116; (4) 1,417; (5) 5,358.

Writing.—Two separate pieces were given as dictation tests to the girls seated in alternate places:

A. 'It was very pleasant sitting upon the deck, watching the ships that passed them, and admiring the beautiful woods and rocks that lined the banks of the river. At last they sailed under a very lofty bridge, and here they were at Bristol. After much noise and shouting they were safely moored in a dock.'

B. 'For there was one little tree that George's father greatly prized. It had been brought from a place at a great distance, and had been carefully planted and tended. George thought he would try his hatchet upon this tree, and he chopped and chopped until it was quite destroyed.'

STANDARD III.

Arithmetic.—Several cards similar to the following were given, all the numbers being expressed in words.

A. (1) Add together one hundred and thirty-six pounds five shillings and sixpence halfpenny, eighty-nine pounds twelve shillings and eight pence, one thousand and ninety-four pounds seven shillings and threepence three farthings, sixty-five pounds thirteen shillings and five pence halfpenny, one hundred and twenty-six pounds eleven shillings and sixpence farthing, fifteen shillings and threepence farthing.

(2) Take forty-nine pounds fifteen shillings and sevenpence halfpenny from one thousand four hundred and forty-five pounds twelve shillings and sixpence farthing.

(3) Divide forty-three thousand nine hundred and seventy-two by four hundred and six.

(4) A gentleman died and left two hundred pounds to be equally divided between his four children. How much did each get?

B. (1) Add together sixty-eight pounds two shillings and fourpence farthing, three hundred and eighteen pounds sixteen shillings and twopence farthing, eighteen pounds fourteen shillings and sixpence halfpenny, four thousand nine hundred and fourteen pounds six shillings and tenpence farthing, twenty-nine thousand four hundred and nineteen pounds fourteen shillings and twopence, six pounds four shillings and eight pence three farthings.

(2) Take forty-eight pounds one shilling and fourpence from one hundred and eighty-nine pounds four shillings and two pence.

(3) Divide one hundred and eighty-four thousand six hundred and twenty-three by thirty-four.

(4) A baker sells 318 loaves in a week; how many will he sell in a day?

C. (1) Add together three pounds four shillings and twopence, sixteen pounds eight shillings and fourpence farthing, three hundred and eighteen pounds twelve shillings and a penny three farthings, four thousand one hundred and twenty-two pounds sixteen shillings and fourpence-halfpenny, and three hundred and forty-eight pounds two shillings and fourpence farthing.

(2) From fourteen pounds two shillings and fourpence half-penny take four pounds nine shillings and two pence farthing.

(3) Divide six hundred and eighty four thousand three hundred and twelve by thirty-four.

(4) A woman buys twelve eggs. If the eggs are threepence each how much change should she get out of ten shillings?

D. (1) Add together twenty-three pounds fourteen shillings and sixpence farthing, seven pounds two shillings and two pence, fifteen pounds three shillings, four pounds, and one pound two shillings and fivepence halfpenny.

(2) Take seven hundred and twenty-one pounds two shillings and sevenpence farthing from one thousand two hundred and fifty-three pounds twelve shillings and two pence three farthings.

(3) Divide five hundred and twenty-three thousand seven hundred and sixty-three by forty-three.

(4) A man earns one pound six shillings in a week. He buys a shirt for three shillings and sixpence and a tie for two shillings. How much has he left out of a week's wages?

Answers:—*A.* (1) £1,513 5s. 9½d.; (2) £1,395 16s. 10¼d.; (3) 108 + 124 over; (4) £50.

B. (1) £34,745 18s. 10d.; (2) £141 2s. 10d.; (3) 5,430 + 3 over; (4) 53 loaves.

C. (1) £4,809 3s. 4¾d.; (2) £9 13s. 2¼d.; (3) 20,126 + 28 over; (4) 7s.

D. (1) £51 5s. 1¾d.; (2) £532 9s. 7½d.; (3) 12,180 + 23 over; (4) £1 os. 6d.

Writing.—The following passage was dictated from the reading book.

'At last she got together another army, but was again beaten, and again obliged to flee with her son. This time, however, they fell into the hands of a gang of robbers, who stripped them of their jewels, and all their gold and silver. While the robbers were quarrelling about their shares of the plunder, the queen and the prince slipped away.'

Grammar was tested by oral exercises on passages in the reading book.

STANDARD IV.

Arithmetic.—Specimen cards.

A. (1) Divide £592,713 3s. 1¾d. by 37.

(2) Reduce 142,925 inches to miles.

(3) Reduce 30 years 100 days 12 hours to hours, reckoning 365 days to a year.

(4) A school was open three hours in the morning and two hours in the afternoon. A girl was late 15 minutes in the morning, and half-an-hour in the afternoon. How many minutes was she in school that day?

B. (1) Reduce 30 miles 5 furlongs to feet.

(2) Multiply £47 10s. 9d. by 52.

(3) How many square perches in 319,868 square inches?

(4) A grocer gave 2 cwts. of sugar in exchange for 56 lbs. of cheese at 8d. What was the value of each lb. of sugar?

C. (1) What is 170 times £32 11s. 5¼d.?

(2) How many square poles are there in 796,805 square feet?

(3) Reduce 2,123 bushels 1 gallon to pints.

(4) A farmer bought 109 sheep and a horse for £300. The horse cost £24 4s. 9d. Find the cost of each sheep.

D. (1) Reduce £976 8s. 6d. to threepences.

(2) How many lbs. in 7 cwt. 1 stone 13 lbs.

(3) Reduce 190,080 minutes to months, weeks, &c.

(4) A man bought tea at 2s. 4½d. a lb., and sold it at 2s. 8d. a lb. What did he gain on 4 cwts?

E. (1) Multiply 19s. 10¼d. by 985.

(2) Bring 5,070,146 half-inches to poles.

(3) Reduce 17 cwts. 2 qrs. 17 lbs. to ounces.

(4) A man had a salary of £150 a year. Out of this he put £75 17s. 3d. in the bank. What was his weekly expenditure?

Answers.—*A.* (1) £16,019 5s. 5¾d. + 20; (2) 2 mls. 2 fur. 1 pl. 4½ yds. 5 in.; (3) 265,212 hrs.; (4) 255 minutes.

B. (1) 161,700 ft.; (2) £2,804 14s. 3d.; (3) 8 pls. 4 sq. yds. 7 sq. ft. 44 sq. in.; (4) 2d.

C. (1) £5,537 4s. 4½d.; (2) 2,926 sq. pls. 21½ sq. yds. 8 sq. ft.; (3) 135,880 pts.; (4) £2 10s. 7d. + 21d.

D. (1) 78,114 threepences; (2) 811 lbs.; (3) 4 mo. 2 wks. 6 days; (4) £6 10s. 8d.

E. (1) £977 16s. 4½d.; (2) 12,803 pls. 1½ yds. 2 ft. 1 in.; (3) 1,977 lbs.; (4) £1 8s. 6d. + 9d.

Writing.—The following passage was dictated from the Holborn New Reader, No. 4:—

'The commonest mode of dealing with culprits in England is to imprison or fine them. A fine is a sum of money paid as a penalty for an offence against the law. This is, however, not imposed, unless the misdemeanour is of a trivial character. For any gross misconduct, the offender must be sent to prison for a length of time proportionate to his guilty conduct: sometimes this imprisonment is for the person's life.'

Grammar, as in the lower standards, was tested by questions on passages in the reading book.

Standard V.

Arithmetic.—Specimen cards.

A. (1) I met a boy and two girls. To the boy I gave ½ of my money, and to each girl ⅓. What fraction had I left?

(2) I bought 57 gals. 3 qts. at 11d. per gallon. I spilt 4 pints, and sold the remainder at 3½d. per quart. How much did I gain?

(3) Make a bill for the following: 5½ lbs. of butter at 1s. 2d. per lb., 2 doz. eggs at 1½d. each, 13 fowls at 1s. 9d. each, a cheese weighing 15 lbs. at 7¾d. per lb., and 17 pints of milk at 2½d. per pint.

(4) If 81 lbs. of sugar cost £1 13s. 9d., what would 639 lbs. cost?

B. (1) The cost of providing tea for 54 children is £1 11s. 6d., what will be the cost of providing 75 children with a similar tea?

(2) Find the cost of 277 cwt. at 16s. 9d. per cwt.?

(3) Make a bill for the following:—2 pints of milk daily for 4 weeks at 1½d. per pint, 15½ lbs. of butter at 1s. 3d. per lb., 27½ lbs. of cheese at 11d. per lb., 7 fowls at 2s. 7½d. each, 4¾ gals. skim milk at 6d. per gallon.

(4) From one sovereign take its third, its fourth, and its fifth, and state what fraction remains.

C. (1) 780 articles cost 11s. 8d. per 100, and were sold at £1 per 100. What was the gain?

(2) If 52 pairs of boots cost £13, what will 41 pairs cost?

(3) Make a bill for the following:—3 dress pieces, each 7 yds., at 6½d. per yard, 13½ yds. of lining at 3½d. per yard, 42 buttons at 1s. 6d. per dozen, making 3 dresses at 5s. 6d. each.

(4) Find the value of $\frac{2}{3} + \frac{1}{6} - \frac{1}{8}$.

D. (1) Add together $\frac{1}{4} + \frac{1}{2} + \frac{1}{5}$, and take $\frac{1}{8}$ from the result.

(2) Find, by practice, the cost of 347 tons at 9s. 1½d. per half ton.

(3) A domestic servant earns £1 17s. 6d. in 60 days. At this rate what will she earn in a year?

(4) Make a bill for: 39 lbs. butter at 9½d. per lb., 24 lbs. cheese at 10½d. per lb., 96 lbs. sugar at 3s. 9d. per 12 lbs., and 12 lbs. coffee. If the bill amounts to £5 3s. 10½d., what is the price of the coffee per lb.?

Answers.—*A.* (1) $\frac{1}{10}$; (2) 13s. 10½d.; (3) 6s. 5d. + 9s. + £1 2s. 9d. + 9s. 8½d. + 3s. 2½d. = £2 11s. 0½d.; (4) £13 6s. 3d.

B. (1) £2 3s. 9d.; (2) £231 19s. 9d.; (3) 7s. + 19s. 4½d. + £1 5s. 2½d. + 18s. 4½d. + 2s. 4½d. = £3 12s. 4d.; (4) $\frac{13}{60}$.

C. (1) £3 5s.; (2) £10 5s.; (3) 11s. 4½d. + 3s. 11½d. + 5s. 3d. + 16s. 6d. = £1 17s. ¾d.; (4) $\frac{11}{14}$.

D. (1) $\frac{1}{14}$; (2) £322 7s. 2½d.; (3) £11 8s. 1½d.; (4) 1s. 10½d.

Writing.—Two passages were dictated from the *Standard* newspaper to alternate children, as follows:

A. 'What is wanted, then, in Wales, are bishops who will impress this necessity on their clergy, and take a lead in the good work themselves. The Welsh are a people peculiarly accessible to the influence of sentiment, imagination and all that may be called the poetry of religion. It is useless to appeal to them in the sober, common-sense language of an ordinary village sermon. They require born preachers and orators, and active and indefatigable pastors.'

B. 'A letter from the Horse Guards, which we print elsewhere, promises to throw an interesting light upon the growth of legends. The recent correspondence in our columns on the subject of the veteran West has, it appears, suggested to the military authorities the propriety of making inquiries about the old man, with a view, in the event of a favourable result, of admitting him to the benefits of the Cambridge Fund for disabled servants.'

Grammar.—The following sentence was given to be parsed and analysed:—

'People in England can work in the fields nearly all the year round.'

Standard VI.

Arithmetic.—Specimen cards.

A. (1) Reduce $\frac{7}{64}$ and $\frac{7}{80}$ to decimals, and subtract the less from the greater.

(2) Convert $\frac{1\frac{7}{10}}{10\frac{1}{5}}$ to a decimal fraction.

(3) Multiply £3 17s. 6·4d. by $\frac{3}{8}$.

(4) $3\frac{3}{4}$ yds. of calico at 8d. per yd. cost 2d. more than half the money in my purse. How much have I?

B. (1) From the sum of ½, ⅓, and ½ take their product.

(2) Find the value of $14\dot{1}4285\dot{7}$ of 1½ guineas.

(3) If $6\frac{2}{3}$ yds. cost 13s. 10½d., what will $8\frac{3}{4}$ yds. cost?

(4) A cook who receives 20 guineas a year commences work on the morning of June 5th, and leaves on the morning of October 29th. What wages should she receive?

C. (1) Reduce to its lowest terms $\frac{847143}{999999}$, and subtract it from 1⅐.

(2) Find the value of $\frac{\cdot005 \times 8\cdot76}{4 - 3\cdot15}$.

(3) Add together ⅔ of 6s. 8d. + ⅛ of 3 guineas + $5\frac{3}{8}$d.

(4) A boy saves 3½d. a day for the last three calendar months of the year. What fraction of half a guinea does he want to make £1 10s.?

D. (1) Simplify $200 - (90\frac{1}{10} + 35\frac{4}{5} + 73\frac{18}{25})$.

(2) Find the value of $\frac{\cdot428 \times 1\cdot6}{8}$, giving the answer as a vulgar fraction.

(3) Find the value of 7·25 of 2s. 6d. + 3·15 florins — 1s. 6·7d.

(4) The circumference of a wheel is $3\frac{1}{7}$ times its diameter, and the diameter is 5 ft. How many times will it turn round in going a mile?

Answers.—*A.* (1) ·021875 ; (2) ·1$\dot{6}$; (3) £2 6s. $6\frac{6}{25}$d. ; (4) 4s. 2d.

B. (1) 1 ; (2) £22 5s. 6d. ; (3) 18s. $\cdot\frac{85}{64}$d. ; (4) £8 8s.

C. (1) $\frac{3}{7}$; (2) ·051529 + ; (3) 17s. $6\frac{1}{5}$d. ; (4) $\frac{19}{63}$.

D. (1) $\frac{17}{50}$; (2) $\frac{107}{1250}$; (3) £1 2s. $10\frac{3}{5}$d. ; (4) 336 times.

Writing.—Each girl had one of the following exercises in composition :—

A. Write an interesting letter to your mother about anything you please.

B. Say why so many women like the Queen, and state if you do or if you do not think she sets her people a good example.

C. Write an essay on the human hair, its use, preservation, fashions, etc.

STANDARD VII.

Arithmetic.—Specimen cards.

A. (1) If 4 tons 17 cwt. at 10s. a ton was sold to gain 25 per cent. Find the total selling price.

(2) Find the amount of £315 15s. 0d. for $3\frac{1}{4}$ years at 4 per cent. per annum, simple interest.

(3) If 24 yards cost £114 4s. 0d. with a width of 26 yards, what will 30 yds. cost with half the width?

(4) The fare of a tramway was 1d. a journey. On Monday it amounted to £$1\frac{5}{16}$, on Tuesday £1 3s. 9d., on Wednesday £2·75. The total number of passengers for Thursday, Friday, and Saturday amounted to 681. What was the average daily number of passengers?

B. (1) A labourer works 6 hrs. a day for 8 days at $10\frac{1}{2}$d. per hour, 12 hrs. a day for 4 days at $9\frac{1}{2}$d. per hour, then 51 hours for £1 19s. $5\frac{1}{4}$d. What is the average price per hour?

(2) I sold a watch for £12 19s. 6d., thus losing $13\frac{1}{3}$ per cent. What did it cost me?

(3) A bankrupt owes £3747 6s. 8d., and can only pay 5s. $6\frac{3}{4}$d. in the £1. Find, by practice, what his creditors lose?

(4) If 39 men and 27 boys can do a piece of work in 45 days of 9 hours each, how long will it take 27 men and 39 boys working 2 hours a day extra, assuming that one man's work is equal to that of 3 boys?

C. (1) The population of a town is 63,250, which is 15 per cent. more than it was 20 years ago. What was the population 20 years ago?

(2) If ·365 of an estate cost £275 10s., what would $\frac{3}{4\frac{1}{6}}$ cost, expressing the answer decimally?

(3) The receipts of a concert for four nights, attended on an average by 375 people, were £73 10s. What would be the receipts for 7 nights if the people numbered 500 per night.

(4) A man's expenses for 70 days were 5s. per day, for 52 days 7s. 6d. per day, and for the remaining days of the year of 365 days his expenses were altogether £85 8s. $6\frac{1}{2}$d. What was his average daily expenditure?

Answers.—*A.* (1) £3 0s. $7\frac{1}{2}$d. ; (2) £356 15s. $11\frac{1}{2}$d. ; (3) £71 7s. 6d. ; (4) $323\frac{1}{2}$ passengers.

(*B.* (1) $9\frac{3}{4}$d. ; (2) £15 ; (3) £2,705 2s. $1\frac{1}{2}$d. ; (4) $44\frac{5}{11}$ days.

C. (1) 55,000 ; (2) £56·609589 + ; (3) £171 10s. ; (4) 6s. $8\frac{1}{2}$d.

Writing.—The composition tests were as follows :—

A. Write all you can of yourself, and fully describe anything of importance that may have happened to you.

B. Name six of the most famous women, living or dead ; and say all you can of any one of them.

C. Would you or would you not like to be a lady doctor? State your reasons in either case.

Grammar was tested in Standards VI. and VII., as in the lower classes by oral questioning on passages in the reading lessons.

Domestic Economy—

1. Of what use is food? Why are eating and drinking too much injurious to our health?

2. Why is a mixed diet best for us? In what way does good cooking help to good health?

3. To what points should attention be given in choosing a house either in town or country?

4. What temperature is most suitable for sitting-rooms and bed-rooms? What would you consider chiefly in choosing a parlour-grate or a kitchen stove?

5. Of what gases does the atmosphere consist, and what are their proportions? How is the air of a room affected by keeping plants in it, by burning gas in it, by crowding it with people?

Singing, *Needlework*, and *Swedish Drill* were tested in the different Standards in the usual way.

How to Teach School Children to Sing from Notes.

BY W. G. McNAUGHT,
Associate of The Royal Academy of Music.

Written Transition.

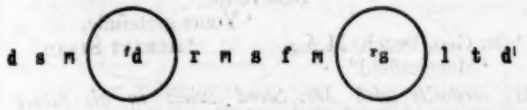
138. The preceding sections have fully described the preliminary modulator work indispensable in teaching transition. The Code, however, requires sight singing from written or printed tests. All the first written exercises should be extremely easy, and the teacher should be indefatigable in explaining again and again what the pupils are told to do at a bridge note. Hitherto, the exercises in tune have made but little demand upon the understanding. An effect has been felt and associated with a name. But no one can sing changes of key without completely grasping the meaning of the bridge note. An effort of mind must be made.

139. In some respects it is unfortunate that bridge notes are always printed with smaller type than the note they are changed to. The size of the bridge note is in inverse proportion to its importance. At first, in looking at such a passage as—

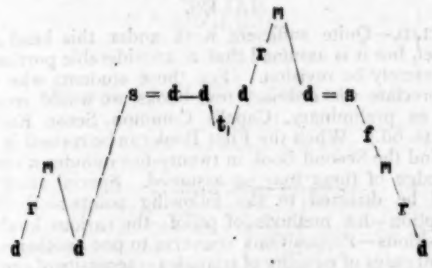
d m s m r d ˈd t_1 d r t_1 d

the pupil is constantly inclined to ignore the little ˢ. To assist the formation of the habit of thinking at changes of key, it is useful in blackboard exercises to draw a circle round the bridge note and the note it becomes.

Illustration :—



140. The following method of showing changes helps the pupil to connect the modulator with the written notation.



141. Changes of key are comparatively easy,

(1) when the bridge note occurs just before the change, *e.g.*:

(Illustration 1)

d m s m s ˢd t, d r t, d ᵈs f r d.

(2) when there is only stepwise movement after the change (see above illustration):

and they are comparatively difficult,

(1) when there is a wide leap to the bridge note, *e.g.*:

(Illustration 2)

d m s r ᵈf l, t, m ˢr t, f m d

(2) when there are wide leaps just after the change (see above illustration 2).

142. At first, written exercises should be first sung on the modulator, and then at once from the written copy. Pupils should sometimes be asked to come forward and show how a written transition exercise can be pointed on the modulator.

Specimen Easy Blackboard Exercises.

To first sharp key. (Right-hand column.)

1. d r f m s ˢd d t, d r d ᵈs f m r d
2. m s f l s f m r ʳs, s, l, s, l, t, d ᵈs f m s t d¹
3. d m s s ˡr r d t, d r t, d s, ˢr r m f m d
4. s l s m r d m ᵐl, l, s, l, t, d r d ᵈs l s f m r r d

To first flat key. (Left-hand column.)

5. m r d m s d¹ ᵈs f m m r d m ᵐl t d¹ r¹ d¹
6. d r m d f ʳd r m r m f m r d r ʳs l s l t d¹
7. m s f r m l s ˡm m r d m s f m ᵐl t d¹ s m d
8. s f m r m d ʳd t, d r m s f m r ʳs l t d¹ s t d¹

In singing these preliminary exercises from the board, a pause should be made when the bridge note is reached, and the pupils should be invited to consider what they have to sing next, whether up or down, etc.

More Difficult Modulator Work.

143. The greatest difficulty of ordinary one-remove transitions is in taking the bridge note without first naming it in the key being quitted.

In such a passage as—

Key D.

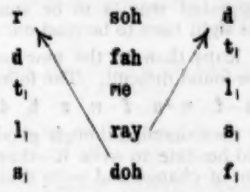
| d :- .m | r .d : t, .d | l :— | s :s .,f |

A.t.

| m :- .ˡr | d .t, : m .r | r :— | d :— ‖

there is no time to properly say **lah** and then call the sound **ray**. The pupil must be trained to *think* the bridge note and call it by the new name. Another plan is to quickly run both syllables into one, thus, '**l'ray.**' This is quite admissible as a process, but it must not be regarded as an end.

144. The modulator affords the best means of exercising pupils in the difficulty of singing changes without naming the bridge. The form of exercise is as follows :—



(1) After pointing several tones in the centre column, the teacher points from **ray** in the centre to **doh** of the right-hand column. The pupil to notice the centre column name (**soh**) level with this **doh**, and to sing it as **doh** without saying the name **soh**.

(2) Teacher points from **doh** of the centre to **ray** of the left column. Pupil to think **soh** and to say **ray**.

When this form of exercise is thoroughly well understood, it is a most valuable aid to the mind in reading transitions.

145. It must never be forgotten that the main difficulty of key changes is not owing to the scale being more difficult in one key than another, but to the fact that the ear finds it troublesome to conceive the tones of one key, *while it still retains the impression of another.* It is the business, therefore, of a good teacher, to endeavour to arrange his exercises so that the new key is quickly established. The early occurrence of the distinguishing tone is the most effectual way of setting up a new key, and of giving the other tones their wonted mental effects. Composers frequently write leaps to the 'new' tone (t, on the right-hand column and **f** on the left-hand column), to give definiteness to the new key. It is well therefore, to practice exercises that systematically develop these leaps.

146. The sharp key should receive first attention. The new **te** should be approached in turn from every other tone of the new scale.

Varied Approaches to the Distinguishing Tone.

Sharp key.

Doh is C or D.

1. d s m f r m ᵐl, t, d r t, ᵈs f m r d
2. d r m f l s ʳs, t, d r m d ˢ:r m f m r d
3. d s m f r m d ᵈf, t, d r d t, d ᵈs f l s d

Doh is G.

4. d s, m r d s, ˡ:r t, d m s s t d¹ ᵈ:s f m r d

Doh is D. (Difficult.)

5. d d¹ t l s f m d¹ t ˢ:m t, d r ʳ:l s f m r r d

Flat key.

(*These are much more difficult than numbers* 1 *to* 5.)

Doh is G.

6. **d t, r d m s, d ˢr f m r d s ˢr m f m r d**

Doh is D.

7. **d m s m dˡ s f ˢd f m r m d ˢr s l s l t dˡ**

8. **d s m f r s l ˡm f m r m ˢˡ t dˡ d m r d**

Doh is B♭.

9. **d s, m, s, d t, d ˢl f f m r m ˢd t, d r t, d**

Doh is C.

10. **d r m dˡ t dˡ s m ˢt, f m r d ˢr s l t dˡ**

Some of the above will require patterning many times before they will be done correctly. They must be regarded as suggested studies to be sung over many times, and not as sight tests to be read off.

147. If other leaps than to the new tone are made, they will often be found difficult. The following

d m s f m ˢd f m r t, d etc.

is by no means uncommon, although good Tonic Sol-fa translators would hesitate to write it—they would rather delay the moment of change and write thus:

d m s f m s ˢˡf m r t, d etc.

The chances are that even fairly practised singers, reading from the first way, would sing the **fah** of the first *flat* key because they have been accustomed to seek for a **fah** in this region, and, moreover, the flat key **fah** would at once sound like a **fah**, while the **ˢd f** would not sound like **fah** at all, but merely like the **doh** of the old key, because the distinguishing tone has not occurred. The rule should be, not to indulge in leaps until the key is fairly settled.

148. Concurrently with exercises or transitions written with bridge notes, exercises written on the imperfect method and including leaps to **fe** and **ta** should be liberally given. The action of one method upon the other is very great. The use of **fe** and **ta** by leaps in tonic sol-fa translations is an absolute necessity, and when pupils pass on to study the staff notation it will be found that skill in making such leaps is extremely useful.

(To be continued.)

—o—

Our Certificate Class.

BY DR. GEORGE BEACH, M.A.

Head Master of Christ Church School, Macclesfield.

We desire cordially to thank those successful pupils of our last year's class, who have so courteously informed us of their examinational success. By permission, we append a specimen letter, which reached us without solicitation, in order to show our present readers what can be done even when unfavourable circumstances prevent tuition being obtained:—

'Adwalton, near Bradford,
'5th March, 1889.

'Dear Sir,—I am very pleased to inform you that I have secured a *Second Division among the Second Year Students* in the recent certificate examination.

'I attribute my success in a great measure to your excellent Syllabus and advice.

'Allow me to thank you most heartily for them, and also for your courtesy in answering my queries so readily and efficiently. *The assistance I have received from you has been the only help I have had.*

'My next exam. will be the London Matric., and I only hope that in studying for it, I may meet with another such friend as you have been to me.

'Believe me,
'Yours gratefully,
'Dr. Geo. Beach, M.A., 'ALBERT STEAD.
'Macclesfield.'

We cordially wish Mr. Stead success in his future studies.

HINTS RESPECTING THE MONTH'S WORK.

MALES.

EUCLID.—Quite sufficient work under this head has been set, but it is assumed that a considerable portion of it will merely be revision. (For those students who fail to appreciate the ordinary text books, we would recommend as preliminary, Capel's Common Sense Euclid, (price 1s. 6d.) When the First Book can be revised in an hour, and the Second Book in twenty-five minutes a sound knowledge of them may be assumed. Special attention should be directed to the following points:—Euclid's assumption—his methods of proof—the various kinds of Propositions—Propositions converse to one another—the different cases of equality of triangles—necessity of certain conditions, such as '*each to each*,' '*included angle*' (Prop. IV.), '*on the same side of it*' (Prop. VII.), '*let* DE *be the side which is not greater than the other*' (Prop. XXIV.), &c.

METHODS OF PROOF.—The reasoning respecting theorems is the most instructive.

1. *Superposition.*—Propositions IV., VII. (See Axiom 8).

2. *Exhaustion.—e. g.* Two things of the same kind, when compared as to magnitude are either equal or unequal, and further as to inequality one of them may be less or greater than the other. If the truth lie in one of x statements, and $x - 1$ statements are proved untrue, then the remaining statement must be correct. If I think of a number which is either 1, 5, or 9, and it is not 1 or 9, it must be 5. See Propositions VI., VII., XIV., XXV., etc., and indeed all Propositions proved by 'Reductio ad Absurdum.'

3. *Reductio ad Absurdum.*—This, as before, stated is the great handmaid of '*Exhaustion.*'

If things are not unequal they must be equal.

The assumption and abandonment of a *False Hypothesis* frequently puzzles the young student.

But the method may popularly be thus explained: We have arrived at an absurdity. Whence comes it? Either from the Hypothesis or false steps in the Proof. But the reasoning employed has been correct, is not absurd, therefore the Hypothesis is absurd, and may be eliminated.

Note that Book I. is divided into two distinct parts, the first 26 Propositions, and the last 22. Of the former part, Props. 4, 8, and 26 are the most important. They shew that in order to prove equality in all respects between two triangles, three of the elements (one at least of which must be a side) in each triangle must be known to be equal.

Of the latter part Props. 27, 32, 34, 35, 43, and 47 are the cardinal ones.

The student should carefully note the difference between equality in area (which is treated of in the second part) and absolute identity, treated of in the first part.

The difficult Twelfth Axiom should be critically studied, the Corollaries should not be neglected, and Euclid's limitation of the magnitude of an angle (to be less than two right angles) should be carefully noted. If the last restriction be not attended to the 2nd Corollary of I.32 would not always be true.

Book II. treats of the relations of squares and rectangles, as contained by segments of lines or sides of triangles. The chief Propositions are 2, 3, 4, 11, 12, 13, and 14.

Proposition 8 may be entirely neglected.

The kindred algebraic equivalents of the Theorems must be understood. Compare—

Prop. II., 4, and $(x + y)^2 = x^2 + 2xy + y^2$, where x and y are the two segments.

Prop. II., 7, and $(x + y)^2 + y^2 = (x + y)\,2y + x^2$, where again x and y are the segments.

Note, that although the analogy between space and number holds good as far as cubes or solids, yet at this point it ceases, for *practically* speaking there cannot be Geometry of more than three dimensions. Therefore, what in Geometry is x^4 analogous to?

ENGLISH.

PARAPHRASING.

Macbeth.—Act I., Sc. 3, Lines 120—142.

Lines 120—122.—If you trusted that prediction in its entirety, it might entice you to become king in addition to being Thane of Cawdor.

Lines 123—126.—Many a time, in order to injure us, evil spirits gain our confidence by a show of integrity in paltry matters, that they may treacherously ruin us in our most important affairs.

Lines 134—137.—If the prediction be good, how is it that this temptation overpowers me, the mere idea of which makes my hair to stand on end, and my heart to palpitate in the most extraordinary manner?

Lines 139—142.—The simple conception of murder yet unexecuted, so shocks the empire of my reason, that imagination overpowers it and I live in a visionary world.

Gray's Ode to Adversity. First 16 lines.
(P. 19, Chambers' edition.)

Lines 1—8.—Both, imperial despots, afflicted by unaccustomed sorrow endured in unsympathetic solitude, complain unnoticed, and also the haughty, fettered in the iron bonds of affliction, are racked by anguish.

Affliction, though sent of God, is inexorable; it civilises and modifies the passions of mankind. With its terrible blows, and its agonising suspense, it alarms the wicked and chastens the good, &c.

Bacon's Essay, No. 1, commencing at line 3. (Lewis's edition. Clarendon Press edition is not yet issued.)

There are some people who rejoice in being inconstant, and to whom settled opinions seem mental slavery. These indulge in licentious thought, in addition to libertine behaviour. Formerly there existed a School of Philosophy of this kind, and even now there are similar shallow and talkative men, although they lack the vigour of old, &c.

Dr Johnson and Gray.

It is remarkable that 'the great doctor' should have in many cases indulged in captious criticisms of Gray, for both as regards their classical scholarship, and their melancholy view of human life (see *Vanity of Human Wishes*), they had much in common.

Our Students should read the article on Gray in Johnson's Lives of the Poets.

Classification of Gray's Poems.

Most of the Odes are lyrical.

We may classify the poems as follows:—

I. *Descriptive:*
Ode I. To Spring; Ode II. On the Death of a favourite Cat; Ode XI. For Music.

II. *Narrative:*
Ode V. Progress of Poetry; Ode VI. The Bard; Ode VII. The Fatal Sisters; Ode VIII. Descent of Odin; Ode IX. Triumph of Owen: Ode X. Death of Hoel.

III. *Didactic:*
Ode III. Eton College; Ode IV. Adversity; Ode XII. Vicissitude.

IV. *Elegiac:*
The Elegy.

Or we may venture upon a cross-classification, thus:—

A *Classical Imitations*, Odes I., V., VI., IX.; B. *Norse Poems*, Odes VII. and VIII.; C. *Welsh Poems*, IX., X.; D. *Didactic*, III., IV., XII., and E. *Elegiac*, The Elegy.

At the risk of indignant censure we think that Ode II. is namby-pamby and unworthy of Gray, although it is 'mock heroic.'

ARITHMETIC.

Square Root.

With respect to Arithmetic the same remark replies which we have written concerning Euclid. More than four weeks' honest work is prescribed in our routines.

We think, however, that a great portion will be merely revision.

In Square Root, the points to be attended to are—
(1) Ordinary Square Root; (2) Square Root of Decimals; (3) Square Root of Repeating Decimals; (4) Square Root of Vulgar Fractions; (5) Fourth, Eighth and Sixteenth Roots, etc.

Two Theorems respecting Square Root are of practical value.

I. If $(n + 1)$ figures have been extracted, n may be obtained by ordinary division, where the root consists of $2n + 1$ figures.

In long sums much work is thus saved by this Theorem; *e.g.*, if the whole Root consist of 19 figures, when 10 figures have been extracted, the remaining 9 can be obtained by ordinary division.

II. The square root of a product is equal to the product of the square roots of its factors.

Thus $\sqrt{100} = 10$. Also, $\sqrt{100} = \sqrt{25} \times \sqrt{4} = 5 \times 2 = 10$.

Required $\sqrt{3} + \sqrt{12} + \sqrt{27} + \sqrt{48} + \sqrt{75} + \sqrt{108} =$
$\sqrt{3} + \sqrt{4 \times 3} + \sqrt{9 \times 3} + \sqrt{16 \times 3} + \sqrt{25 \times 3} + \sqrt{36 \times 3} =$
$\sqrt{3} + 2\sqrt{3} + 3\sqrt{3} + 4\sqrt{3} + 5\sqrt{3} + 6\sqrt{3} =$
$21\sqrt{3}$.

So that instead of having to extract SIX square roots, we have only ONE to arrive at.

The Fourth Root is the Square Root of the Square Root.

The Eighth Root is the Square Root of the Square Root of the Square Root.

Cube Root.

The difficulty in Cube Root is not in understanding but in remembering the process.

Many different systems have been suggested, but we recommend the following:—

(a) From the decimal point, mark off in periods of threes to the right and left.

(b) From the farthest period to the left, extract the highest cube, placing the root in the answer.

(c) After subtracting bring down the next period.

(d) For trial divisor take three times the square of the root already obtained, and affix two cyphers.

(e) For supplementary divisor take three times the root already obtained.

(f) Find how many times (ordinary division) the trial divisor will go.

(g) Affix this figure to the right hand of the supplementary divisor.

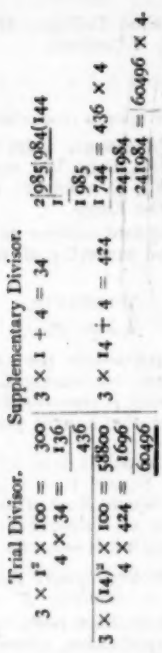
(h) Multiply this resulting supplementary divisor by the obtained figure, and—

(i) Add the product to the total divisor.

(j) Multiply the resulting trial divisor by the obtained figure, and subtract, etc.

(k) After bringing down next period proceed with *(d)*, *(e)*, *(f)*.....*(j)*, etc.

Example :-



Two Theorems respecting Cube Root are of practical value.

I. If $(n + 2)$ figures have been extracted, n more can be obtained by ordinary division, where the root consists of $(2n + 2)$ figures. Thus, if the whole root consist of 20 figures, when 11 have been extracted, the remaining 9 can be found by ordinary division.

II. The cube root of a product is equal to the product of the cube roots of its factors.

Thus $\sqrt[3]{216} = 6$. Also $\sqrt[3]{216} = \sqrt[3]{27 \times 8} = \sqrt[3]{27} \times \sqrt[3]{8}$
$= 3 \times 2 = 6.$

Required $\sqrt[3]{3} + \sqrt[3]{24} + \sqrt[3]{81} + \sqrt[3]{192} + \sqrt[3]{375} + \sqrt[3]{648} =$
$\sqrt[3]{3} + \sqrt[3]{8 \times 3} + \sqrt[3]{27 \times 3} + \sqrt[3]{64 \times 3} + \sqrt[3]{125 \times 3} + \sqrt[3]{216 \times 3} =$
$\sqrt[3]{3} + 2\sqrt[3]{3} + 3\sqrt[3]{3} + 4\sqrt[3]{3} + 5\sqrt[3]{3} + 6\sqrt[3]{3} =$
$21\sqrt[3]{3}$

So that instead of having to extract SIX cube roots, we have only ONE to arrive at.

The chief points in cube root to be attended to are :—

(1) Ordinary Cube Root ; (2) Cube Root of Decimals ; (3) Cube Root of Circulating Decimals ; (4) Cube Root of Vulgar Fractions ; (5) Ninth, Twenty-seventh, and Eighty-first Roots, etc.

The *Ninth Root* is the Cube Root of the Cube Root.

The *Twenty-seventh Root* is the Cube Root of the Cube Root of the Cube Root.

By a combination of Square and Cube Root, we can arrive at the Sixth Root, Twelfth Root, or Eighteenth Root, etc.

The *Sixth Root* is the Square Root of the Cube Root.

The *Twelfth Root* is the Square Root of the Square Root of the Cube Root.

The *Eighteenth Root* is the Square Root of the Cube Root of the Cube Root.

Stocks.

(CAPEL'S CATCH QUESTIONS, pp. 207—217, are excellent, and are strongly recommended.)

After understanding what Stocks are, and the meaning of the different terms employed, such as Consols, Premium, Discount, Brokerage, Par, &c., the Student should select and work problems in the following order :—

GIVEN.	REQUIRED.
Amount of Stock and kind of Stock ...	Income.
" " selling price	Cash realised.
Income and kind of Stock	Amount of Stock.
" amount of Stock	Kind of Stock.
Cash realised and selling price.....	Amount of Stock.
Amount of Stock and cash realised.....	Selling price.
Kind of Stock and real per centage.....	Buying price.
" " and buying price	Real per centage.
Real per centage "	Kind of Stock.

If the above nine varieties are understood all the problems which are complicated, or involve double transactions, should be manageable. Special attention should be paid to the instances where brokerage or income-tax is introduced.

Interest (Simple).

No comment is needed upon those sums which giving Principal (P), Rate per cent. (R) and Time (T) require the Interest (I) or Amount (A).

All other simple problems resolve themselves into

Given (1) P, R and I or A, *to find* T.
(2) T, R and I, *to find* P.
(3) T, P and I or A, *to find* R.

If the pupil thoroughly understand *Compound Proportion* no difficulty will be experienced.

Examples :—

(1) £250 at 5 per cent. earns £50 (or amounts to £300), required length of time.

Proportional form :

If it take one year for £100 to earn £5, how long will it take £250 to earn £50?

(2) In four years at 5 per cent. £50 interest is received, what was the principal invested ?

Proportional form :

If it take £100 to earn £5 in one year, what sum will be required to earn £50 in four years?

(3) In four years £250 earns £50 (or amounts to £300), required rate per cent.

Proportional form :

If £50 is earned in four years by £250, what sum will be earned by £100 in one year ?

Interest (Compound).

All the remarks on simple interest apply, but, in addition, we have to be prepared to deal with instances where the interest is payable half-yearly or quarterly, &c., and where the simple and compound interests are compared.

Where the interest is payable { (1) half-yearly, (2) every four months, (3) quarterly, (4) every two months, (5) every month } multiply the number of years by

{ (1) 2, (2) 3, (3) 4, (4) 6, (5) 12 } and divide the rate per cent. by { (1) 2, (2) 3, (3) 4, (4) 6, (5) 12 }

Example :—

'Find the compound interest on £1,000 for two years at 4 per cent., interest being reckoned every month' *equals* '*Find the C. I. on £1,000 for 24 years at ½ per cent.*'

ROUTINE FOR APRIL (MALES). To be used in connection with the 'HINTS.'

DAY	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
MONDAY	Articles 81 to 86 of Code, Articles 1 to 7 of Circular No. 217 (p. 91 of Heller's Code), First half of p. 128 (Heller's Code)	First thirteen Propositions of Euclid, Book I. *not forgetting definitions, etc.*	Paraphrase Lines 129—142 of 'Macbeth,' Act I., Scene 3	Deductions 40, 45, 52, 58, 60, 64, 69, 74, 82, 83 of Egan, Part I.	Paraphrase the first 16 lines of Gray's 'Hymn to Adversity'	Causes which affect Climate, Findlater, Part I., pp. 115—124	Classify Gray's Poems	Physical Map of England	Grammar — Answer mentally Questions in '*Mother Tongue*,' pp. 8 and 9, Third Edition; pp. 11 and 12, Fourth Edition	Flora and Fauna of the Torrid Zone — Information to be collected from miscellaneous sources.	Euclid — All Book II.	Read carefully Bacon's Essays, I.—III., pp. 13 to 29, Lewis' Bacon
TUESDAY	Shape and Size of the Earth ('*Practical Teacher*,' March, 1888)	Square Root	Reign of James II. (Ross, pp. 300—314) 1685—1689	Cube Root of Arithmetic	Reign of William III. 1689—1702 (Ross, pp. 315—330)	Notes of a Reading Lesson to Standard I.	Deductions 135, 137, 148, 151, 156, 163, 165, 168, 175, 179 of Egan, Part I.	Reign of Anne, 1702—1714 (Ross, pp. 331—343)	Interest	Infectious Diseases, Wounds and Cutaneous Disorders (Carpenter, pp. 163—202)	*Revise* Algebra	*Revise* reigns of James, William and Anne
WEDNESDAY	Involution and Evolution of Algebra	Processes of Reasoning, Dr. Coupland, pp. 54—67	Deductions 13, 14, 16, 19, 20, 23, 25, 26, 31, 36 of Egan, Part I.	Surds (Algebra)	First forty-one Propositions of Euclid, Book I.	Write (*for future use*) a Short Life of Shakespere	Ratios — Algebra	Outlines of History to end of Stephen's reign	Paraphrase 'Certainly there be that delight in giddiness.....nor for advantage as withthemerchant, but for the lie's sake.' Bacon's Essays, No. 1	Deductions 352, 359, 363, 364, 366, 369, 371, 374, 378, 388 of Egan, Part I.	Read carefully Bacon's Essays IV.—VII., pp. 29 to 48, Lewis' Bacon	Map of France
THURSDAY	Write 30 lines of Composition upon 'I dare do all that may become a man, Who dares do more is none'	Write a Text-hand copy of the word 'Egyptian' and a Small-hand copy of the Capital Letters	First twenty-six Propositions of Euclid, Book I.	Political Geography of England	Stocks	Tables of Norman and Plantagenet Dynasties	The Solar, Mean Solar, Sidereal Day (Page 101 of 'Practical Teacher,' April, 1888)	First ten Propositions of Euclid, Book II.	Write out a list of Good Habits with their opposing Bad Habits	Cube and Square Root of both Algebra and Arithmetic	Dates to end of Richard I.	*Study Mr. Kinton's Article on 'Macbeth'*
FRIDAY	The connection of Middleton and Holinshed with the play of 'Macbeth.' (See Preface)	Physical Features of England	Mensuration of Squares, Rectangles and Surfaces of Rectilinear Solids	*Revise* Algebra or Euclid	Mr. Cowham's Article on Locke in 'Practical Teacher' for March, 1889	Deductions 92, 101, 105, 107, 110, 113, 115, 118, 121, 128 of Egan, Part I.	Write thirty lines of Composition upon the Life of Bacon	Outlines of History to end of Richard I.	G.C.M. and L.C.M. of Algebra	Notes of a Writing Lesson in Standard VII.	Discount	What is the position of 'Macbeth' amongst Shakespere's plays?
SATURDAY	Important Dates to end of Stephen's reign	Notes of 'Macbeth' to end of Act I., Scene 3	G.C.M. (H.C.F.) and L.C.M. of Algebra	Site of School — To end of p. 27 of Carpenter's Hygiene	Dr. Johnson's criticism of Gray. Is it a just one? (See Lives of the Poets)	Learn what Registers are necessary, and what information the Admission Register must contain	Euclid — Book I.	Mensuration of Parallelograms and Triangles	Geography of Scotland	Deductions 313, 315, 317, 321, 327, 329, 334, 341, 343 346 of Egan, Part I.	*Read our Article in 'Practical Teacher' for March, 1888*	*Mr. Kinton's Article on 'Macbeth' in 'Practical Teacher' for March, 1889*	Geography of Ireland	Mensuration of right-lined surfaces	*Mr. Cowham's Article on Locke in 'Practical Teacher' for March, 1889*	Repetition or careful reading of 'Macbeth'

ROUTINE FOR APRIL (FEMALES). To be used in connection with the 'HINTS.'

DAY	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
MONDAY	Articles 81 to 86 of Code. Articles 1 to 7 of Circular No. 217 (page 91 of Heller's Code). First half of page 128 (Heller's Code)	The essential constituents of a True Food	Paraphrase Lines 120—142 of Macbeth Act I. Scene 3	How should an artisan's wage of 30/- be spent, in a family of five?	Paraphrase Lines 1 to 28 of Macbeth Act I. Scene 7	Political Geography of Hindostan	Analyse and Parse difficult words of Lines 60—72 Macbeth Act I. Scene 7	Draw map of British North America	Answer mentally the Questions on pp. 8 and 9 Third Edition or pp. 11 and 12 Fourth Edition of *Mother Tongue.*	Geography of Canada	How would you make Gruel, Beef-Tea, and Barley-Water?	Read carefully Bacon's Essays I.—III. pp. 13 to 29, Lewis' Bacon
TUESDAY	Physical Features of England	Vulgar Fractions	The doctrine of the Divine Right of Kings, its inception, propagation and consequences.	Proportion	Colonisation of New England. Sir Walter Raleigh	Notes of a Reading Lesson to Standard I.	Learn the measurements and draw a diagram of a Muslin Pinafore	Acquisition of St. Helena, West African Settlements, Bermudas, Jamaica, etc., Honduras	Stocks	Infectious Diseases, Wounds, and Cutaneous Disorders, Carpenter, pp. 163—202	Discount	Reign of Charles I. 1625—1649 (Ross, pp. 245—266)
WEDNESDAY	Learn the measurements of 'a woman's night-dress'	Processes of Reasoning, Dr. Coupland pp. 54—67	Describe a house and its furniture which can be maintained in a small town for 30/- per week	Describe the making of a woman's night-dress	Advantages of a mixed diet (flesh and vegetable) Disorders from improper diets	Write *(for future use)* a short life of Shakespere	Stocks	James I's. Book of Sports. Navigation Act of 1651	Learn for Repetition Lines 1 to 28 of Macbeth Act I. Scene 7; or read Macbeth	Cut out on sectional paper and tack together the Sleeve-half of a Muslin Pinafore	The allusions in Bacon's Essays IV.—VII. pp. 29 to 48 Lewis' Bacon	Geography of Ireland
THURSDAY	Write 30 lines of Composition upon 'I dare do all that may become a man, Who dares do more is none'	Write a text-hand copy of the word 'Egyptian' and a small-hand copy of the Capital Letters	Practise the different stitches on a piece of linen 9 inches square	Draw a map of Hindostan	Interest	Hampton Court Conference. Petition of Right	Geography of Hindostan	The ordinary Beverages	Write out a list of Good Habits and their opposing Bad Habits	Square Root and Fourth Root	The Great Rebellion, alias Civil War, 1642—1648	*Study Mr. Kinton's Article on Macbeth*
FRIDAY	The connection of Middleton and Holinshed with the play of Macbeth (See Preface)	Draw a Physical map of England	Decimal Fractions	Cut out on sectional paper and tack together the right half of a woman's night-dress	*Mr. Cowham's Article on Locke in 'Practical Teacher' for March, 1889*	The different diets required for the various ordinary ailments	What is the position of Macbeth among Shakespere's plays?'	Lives and works of Milton, Clarendon, Denham, Cowley, Lovelace, and Evelyn	Discount	Notes of a Writing Lesson to Standard VII.	*Revise* any Arithmetic	How should food for Invalids differ from ordinary food?
SATURDAY	Dates of James I's. reign	Analyse and Parse difficult words of Macbeth Act I. Scene 3 Lines 69—81	Learn Physical Features of Hindostan	Site of School To end of p. 27 of Carpenter's Hygiene	What are the chief characteristics of Bacon's Essays?	Learn what Registers are necessary, and what information the Admission Register should contain	Reign of James I. (Ross, pp. 233 to 244)	Insurance	Geography of Scotland	Practise the different stitches on a piece of calico 9 inches square	*Read our Article in 'Practical Teacher' for March, 1888*	*Mr. Kinton's Article on Macbeth in 'Practical Teacher' for March, 1889*	Remaining Geography of British North America	How can a Working Man best invest a few pounds annually?	*Mr. Cowham's Articles on Locke in 'Practical Teacher' for March, 1889*	Practise Stocking-web and a Print Patch

Discount.

The chief principles are :—

(1) The Discount (D) + the Present Worth (W) = the Principal (P); or P − D = W; or P − W = D.

(2) The Discount = the interest of the Present Worth.

The rule may be thus expressed $\frac{P+I}{P} = \frac{P}{W} = \frac{I}{D}$, and from these, by the theorems of Proportion, any number of formulæ for the construction and solution of problems can be obtained.

The ordinary problems are :—

(1) Given P and I to find D.
(2) „ P and D „ I.
(3) „ I and D „ P.

(1) From the rule, *as* P + I : P :: I : required D.
(2) „ „ *as* W : P :: D : required I.
i.e. P − D : P :: D : required I.
(3) „ „ *as* I : D :: P : W.
∴ D : I :: W : required P.
∴ I − D : I :: P − W : required P.
∴ I − D : I :: D : required P.

HISTORY.

1685—1727.

James II.—Family, Dates, Dubious Proceedings at commencement of Reign, Plots and Rebellions, The Bloody Assize, The Standing Army, Attempts to re-establish Romanism, The King versus the Clergy, The Universities and the Nonconformists, Declaration of Indulgence, Ecclesiastical Commission Court, The Dispensing and Suspensory Powers of the King, The King a pensioner of France, Trial of Seven Bishops, Petition to William of Orange, The Revolution, Interregnum, Convention Parliament, Act of Settlement, Declaration of Rights, Revocation of Edict of Nantes, Improvement of the Silk Manufacture.

William and Mary.—Claim to Throne, Dates, Character and History of William, Bill of Rights, Acts of Settlement (1700 and 1702), Toleration Act, Settlement of Revenue, Mutiny Act, The Non-jurors, Whigs and Tories, The National Debt, Freedom of Press, Poor Law Act, The Cabinet Constituted, Appropriation of Supplies, Bank of England Established, The Junto, Domestic Plots, Scotch Rebellion, The Darien Scheme, Massacre of Glencoe, Irish Affairs, Wars with France, Treaty of Ryswick, The Partition Treaties, Naval Affairs, Greenwich Hospital, Christian Societies, Inventions.

Anne.—Claim to Throne, Dates, Jacobitism, Occasional Conformity Act, Schism Act, Queen Anne's Bounty, Union of England and Scotland, Dr. Sacheverel, Property Qualification Act, Anne's Favorites, Marlborough's Campaigns, Affairs in Spain, Capture of Gibraltar, Naval Operations, Treaty of Utrecht, The Assiento Contract, Institution of Post Office, East India Companies, Inventions.

HISTORY OF ENGLAND AND THE ENGLISH PEOPLE.—*By Sir G. Cox, M.A., is peculiarly suited for obtaining general knowledge therefrom, and is most agreeable reading.*

ALGEBRA.

Involution.—The expansions of $(a \pm b)^n$ where n = 1, 2, 3 or 4—how to form the square of any multinomial—how to find the cube or fourth power of multinomial by treating it binomially—should all be thoroughly mastered.

Evolution.—It will be sufficient to understand Cube Root and Square Root, but see also our remarks under Arithmetic.

Note *A.*—That negative squares cannot have real roots.
B.—That positive squares can have two roots, one positive, the other negative.
C.—That the cube root of a quantity has the same sign as the quantity.

Greatest Common Measure. (See our remarks on Factors, page 334, Practical Teacher, '88.)

These should be solved where possible by Factors.

Where the ordinary process is adopted, paper room will be saved by adopting the following form. Required G. C. M. of $2x^3 - 5x^2 + 9x - 9$ and $3x^3 + 6x + 9$.

$2x^3 - 5x^2 + 9x - 9$	$3x^3 + 6x + 9$
3	2
$6x^3 - 15x^2 + 27x - 27$	$6x^3 + 12x + 18$
$6x^3 + 12x + 18$	$6x^3 - 6x^2 + 18x$
$-15x^2 + 15x - 45$	$6x^2 - 6x + 18$
Answer $x^2 - x + 3$	Answer $x^2 - x + 3$

Least Common Multiple.—Prepare also the proof of this rule.

Ratio.—Ratio must not be confounded with Proportion, which latter is the 'similitude of ratios.'

FEMALES.

ENGLISH.

Paraphrasing. (Lines 1 to 28, Act I., Scene 7.)

If its execution really concluded the matter, then it would be best to finish it as quickly as possible. If the murder could be perpetrated as an isolated act, and could at its completion certainly grasp success — if a single stab comprised at once the essence and consequences of the act, as regards only this short and shallow existence—we would risk the hereafter. But we know that even in this life crimes remain not unpunished, that the instigators to outrage fall victims to their own plans, that impartial justice often causes the murderer's potion to be drained by its concocters, &c. SEE ALSO 'HINTS ON PARAPHRASING' (MALES).

Parsing. (Lines 69—81, Act I., Scene 3) :—

More, Know, How, Gentleman, Stands, To be, From, Owe, Why, Blasted.

(Lines 60—72, Act I., Scene 7) :—

Screw, Fail, Whereto, The, Rather, Journey, Warder, Limbec, As, What, Put.

HISTORY.

(See also Rev. Sir G. Cox, M.A., History of English People.)

James I.—Descent and claim to Throne; Family; Main, Bye, and Gunpowder Plots; Pouch's insurrection; James' four Parliaments; 'The Apology;' Illegal Customs Dues; Arbitrary Rule 1614—1621; Monopolies: Growing power of the Commons; Impeachment of Bacon; Millenary Petition, Hampton Court Conference, Authorised Version of Bible, the King's favourites, Scotch Affairs, Irish Affairs, Colonisation of Ulster and New Plymouth, &c., East India and Russian Companies, Wars in the Palatinate and with Spain, Divine Right of Kings, Book of Sports, Fate of Coke and Raleigh, Invention of Logarithms, Discovery of Circulation of the Blood, Farthings coined, First Newspaper published.

Charles I.—Wars with Spain and France, Application of Theory of Divine Right, Duplicity of Charles, Charles' first three Parliaments, Petition of Right, Persecution of the Opposition, Assassination of Buckingham, Eleven Years Arbitrary Government, The Star Chamber, Ship Money, &c., Projects of Strafford and Laud, Emigration of Puritans, The Scotch Covenant, The Short Parliament, The Long Parliament, Redress of Grievances, Fate of Strafford and Laud, Triennial Bill, Abolition of Illegal Courts, Grand Remonstrance, Attempt to Seize the Five Members, The Militia Bill, The Civil War, Fate of Falkland and Hampden, Cromwell's Ironsides, Self-denying Ordinance, Collapse of the Royalists, Presbyterians and Independents, Captivity of the King, The 'Levellers,' Pride's Purge, Trial and Execution of Charles, Irish Rebellion, Battle of Preston, Origin of Postal System, Coal used, Cotton Manufacture commenced.

ARITHMETIC.

Vulgar Fractions.—Note that $\frac{2}{3}$ may mean (1) two parts out of three (2) two divided by three, and (3) as two is to three.

Be able to draw diagrams illustrating the simple operations or rules, and be careful in dealing with brackets. Remember the old rule, '÷ and × connect, + and − separate.'

Decimals.—When obtaining a result correct (say) to five places, work out your answer to (say) seven places and let your fifth figure, altered if needed, be the nearest approximation, taking into consideration the discarded (two) places

Decimal nine repeater = one. $\dot{9} = 1$.

Where the dividend only is a circulator, the quotient may be obtained in the ordinary way.

When a vulgar fraction is converted into a decimal, the number of places cannot exceed the number represented by the denominator.

Learn to prove the rule for turning recurring decimals into vulgar fractions, practise sums that are a mixture of vulgar and decimal fractions.

Proportion.—Both 'Rule of Three' and the 'Unitary Method' should be well understood. Great care must be taken when the ratio is *inverse*, as is often the case where the element of time is introduced.

In problems where all the three terms are of the same kind, you may sometimes transpose the second and third terms with advantage: *e.g.*

As £9 12s. 2d. : £16 :: £13 14s. 8d. : *x*.
Could be with advantage stated
As £9 12s. 2d. : £13 14s. 8d. :: £16 : *x*.

Square Root, etc., Stocks, Interest and Discount. (See '*Males*.')

MAP DRAWING.

'*How to Draw a Map*,' by A. Gardiner, 1s., is an excellent little manual. We do not advise, at this stage, elaborate maps, but many correct though rough ones. Place in only one line of latitude and one of longitude.

NEEDLEWORK.

Very wise words indeed are those of Miss Jones, where in many places she advocates ATTENTION TO DETAIL, for in nothing under the sun is this as necessary as in Needlework, and its kindred subjects.

Read over very carefully pp. 86 to 93 of 'NEEDLEWORK AND CUTTING-OUT,' but above all, get some lady who thoroughly understands Needlework, both practical and technical, to start you in the right way.

More marks, especially by provincial students, are lost in Needlework than are generally imagined; and in this subject, as in everything else, the non-proficient is ignorant of her lack of skill, and therefore cannot improve until a more excellent way is pointed out.

A Drawing-to-Scale Book (blank), in which to draw the patterns, will be of great service to the Student

DOMESTIC ECONOMY.

We have, at present, little to add on this subject beyond what we wrote last year, which will be prescribed for study in due time. However, we advise that as much of ELEMENTARY HUMAN PHYSIOLOGY BE LEARNT as will suffice for an intelligent understanding of the *assimilation of food, the process of respiration, how the system is deranged, weakness and the ordinary diseases, and the rejection of waste products.*

BOOKS REQUIRED.

We must apologise for an inadvertent, but unfortunate, mistake in our BOOK LIST last month. Under the head 'MUSIC' we meant to recommend DUNSTAN'S TEACHERS' MANUAL, which is far-and-away the best text-book on the subject, and is suitable alike for Tonic Sol-Fa and the Staff Notation.

Mr. Dunstan is a Musical Bachelor of Cambridge, and Lecturer on Music at two training colleges.

Mr. Curwen's book was before us for another purpose in connection with the Tonic Sol-Fa College.

The best way to procure *Stamford's Composite Register* is to get the Head Master of your School to write to 55, Charing Cross, S.W., enclosing 3d. for postage.

CORRESPONDENCE.

We shall be pleased to reply briefly and through this column to any seeking information or advice.

Answers demanding urgency will be promptly forwarded per post on receipt of stamped and addressed envelope.

Any suggestion tending to the greater utility and interest of these articles, or to the greater convenience of 'COACH' *or* PUPIL, *will be thankfully received and thoughtfully considered.*

J. W. (Birkenhead).—We cannot undertake to recommend Tutors. In the case you mention, ask for reference to two or three former pupils.

SEMI (Preston).—Your friend, whose school has been already examined, should write to H.M. Inspector, and probably he will arrange to hear his repetition at another school.

J. E. B. (Birmingham).—You must take the Mensuration.

G. T. V. (Merthyr).—Thanks for your kind suggestions, which shall, where possible, be complied with.

Answered by ordinary letter.—E. B. (Lancaster), J. E. D. (Louth), G. W. T. (Southampton), G. T. V. (Merthyr) two letters, J. B. C. (Banbury), E. J. G. (Upper Bangor), G. F. P. (Northampton), A. S. (Bradford), J. M. W. (Saltcoats), A. H. L. (Normanton), A. T. (Stanstead), A. R. (West Lavington, Devizes), H. J. (Connah's Quay), E. W. (Leeds).

Will our correspondents from Lancaster, Upper Bangor and Louth kindly communicate to us the issue of their affairs?

(To be continued.)

How a Scotch School was Examined.

Music.—Tested on Modulator in the usual way.

d s f s fe s l se l d' t d' ta l s fe s d m fe s m f se l &c.

No ear exercises.

Sight Singing.—Standard III., Key C.

:s_1	d :d	r :r	m :-.r	d :s_1	f :f
m.r :m.f	r :—	— :s_1	f :f	r :r	
s :-.s	l.s :f.m	r :r	t_1 :t_1	d :—	

Standard V., Key B♭.

m_1.s_1:d.m_1:s_1	f_1 :l_1 :l_1	s_1.t_1:r.f :m.r	d :— :		
d :m :s	f :-.m :r	s_1 :t_1.r :f	m :-.r :d		
m_1.s_1:d.m_1:s_1	f_1 :l_1 :l_1	s_1.t_1:r.f :m.r	d :— :		

Standard VI., Key C.

m :d.m | s :s	f :f.m | r :—	f :r.f | l :l	}
l :s.f | m :—	l :f.l | d' :d'	d :ta.l | s :—	}
— : | :	r .t :l	se.l :f .r | d .m :d .m	}
s :— | r .t :l	se.l :f .r | d .m :d .m	s :—	‖

Standard IV. sang a school song prepared during the year.

INFANTS.

Not a separate department. All read from books. Intelligence from picture of a little girl holding a bell in both hands, ringing it for her kitten to come and drink milk from a cup standing on floor. What do you see in picture? Why is the little girl holding the bell in *both* hands? Is it so heavy? What is a kitten? How would you know a kitten from a cat? Why did the little girl put the cup on the floor? &c.

Writing.—Capital and small letters with a line of figures. Every slate was looked.

Arithmetic.—4 and 5? 3 and 3 and 2? &c., 4 less than 7? 11 balls in one hand and 9 in the other, how many altogether? How many in one hand more than in the other? What would three 3's make?

Singing.—One song taken. Inspector took modulator exercises and gave some rather difficult intervals. He sang a few notes to laa and asked the children to repeat them.

Object Lesson.—'Tea.' The teacher was allowed to choose *three* from a list of twelve.

Colour and Form.—Taken from snowdrops growing in pots in school. What kind of lines required to draw snowdrop? and pot? Colour of flower? and pot? Where is the lightest green on the snowdrop. If we had no *green* how could we make it up ourselves? He asked also the names of colours shown on sheet.

STANDARD I.

Reading.—Part from the Star Reader. Lesson on 'The Horse.' Part from Royal Reader, No. 1, all read.

Intelligence not taken with closed books, but during the course of the reading lesson, and this method was followed through every class. Meanings of such words as 'gentle' and 'treated' accepted either in phrases or sentences.

Arithmetic.—No puzzling notation. Only two sums given, and in words:—

(1) 360 + 19 + 251 + 7 + 726.
1363. Ans.

(2) From 654 take 236.
418. Ans.

Writing.—Copied from reading-books and filled one side of slate.

No spelling asked. Singing, Object-Lesson, and Colour and Form taken along with Infants.

STANDARD II.

Reading.—Some from Star Reader. Lesson on 'The Laplander.' Some from Royal Reader, the lesson on the sheep in distress—lamb fallen into the pool—boy lifts it out, &c.

Intelligence.—What is meant by struggling in vain? a pool? Why could the lamb not get out? Whether would it be better to fall into a pool or into a river? If the lamb had fallen into a river what would have become of it? (Inspector wished to bring out clearly the idea of *force* in the river.)

Dictation.—'Standing on its hind feet, it put its paws into the baskets and helped itself to the fruit and other good things in them.'

The Inspector examined the sums himself, and no difficult notation was given. Something like the following was read in words:—

(1) 6421 + 385 + 2179 + 5746 + 9 + 462.
15,202. Ans.

(2) From 6,357 take 3,428.
2,929. Ans.

(3) Multiply 657,243 by 5.
3,286,215. Ans.

Writing copies not asked for in any class.

Singing taken with Standard I. and Infants.

STANDARD III.

Reading.—Star and Royal Readers. All read from the Royal Readers 'The English Girl and her Ayah.'

Intelligence.—Meanings of words in lesson read, 'tent,' 'Ayah,' &c.

Repetition.—Little Jim. One asked here and there in class.

Analysis.—Original sentences given by the Inspector. 'The girl milked the cow.' 'The boy stole the yarn.' 'The miller ground the corn,' &c.

History.—Confined to Robert the Bruce. Where born? Leaders at Bannockburn? How many killed? &c.

Geography.—Rivers of Scotland generally. Towns.

Arithmetic.—Four sums on card:—

(1) Multiply six hundred and forty-seven thousand three hundred and ninety-eight by four thousand three hundred and seventy-nine.
2,834,955,842. Ans.

(2) Multiply three hundred and twenty-six thousand seven hundred and fifty-one by eighty-six.
28,100,586. Ans.

(3) Divide three hundred and fourteen thousand six hundred and twenty-seven by three hundred and seventy-six.
836 + 291. Ans.

(4) From £435 11s. 6¼d. take £276 8s. 9½d.
£159 2s. 8¾d. Ans.

Dictation.—Five lines from the lesson on 'The Humming Bird' in Royal Reader.

STANDARD IV.

Reading.—From the lesson on the 'Mocking Bird' in Star Reader, and from Historical and Geographical Reader—the lesson on the 'Mountains of Ireland.' No intelligence asked.

Repetition.—'Lord Ullin's Daughter.' Analysis taken from first stanza, but no questions on meaning.

Dictation.—'He is an admirable mimic, and very mischievous; for he loves to play tricks upon his feathered neighbours. He will scream like a hawk, and then they will hide themselves, fancying that their enemy is upon them; or he will imitate the call of

the birds to their mates, and draw them off their nests.' Even the sportsman is often led astray by him; and goes in search of birds that are hundreds of miles away, fancying they are close at hand.'

History.—Questions on the whole period studied by Standard IV. Dates of accession of kings, &c., and the relationship with each other. Another name for a Commonwealth?

Geography.—Ireland—especially. Names of all the mountains, rivers, capes, gulfs and openings in coast. Manufacturing towns of Yorkshire and Lancashire. A good deal of questioning about the towns. No questions on Scotland.

Arithmetic.—(1) Divide thirty-six thousand seven hundred and sixty-four pounds fifteen shillings and tenpence by four hundred and thirty-six.

£84 6s. 5½d. Ans.

(2) Reduce 242 acres 15 poles to poles.

38735 po. Ans.

(3) How many seconds in 6 weeks 1 day 13 hours 37 minutes 12 seconds? 3,764,232 sec. Ans.

(4) Multiply 5 tons 3 qrs. 6 lbs. by 24 (using factors)

120 tons 19 cwts. 1 qr. 4 lbs. Ans.

STANDARD V.

Reading.—Star and Royal Readers. The lesson on Nijni-Novgorod. The World's Fair. Intelligence taken during the course of the lesson—meaning of such words as 'booth,' 'uniform,' &c.

Essay.—A story was read about a Waterloo pensioner who entered a shop in Stirling and asked how much tobacco he could have for a penny. The shopkeeper replied that he could have as much as would go from ear to ear. The pensioner was afraid that there was not as much in the shop to satisfy that condition, as one of his ears was lying on the field of Waterloo.

Repetition.—'Gray's Elegy.' One chosen here and there in class, and the piece gave good scope for intelligence.

Analysis taken orally from the verse beginning 'Haply some hoary-headed swain,' &c. No parsing asked.

Geography.—Draw a map of South America or Africa (for girls); boys questioned on South America as compared with Africa. Which had the greater number of rivers? Compare the rivers of these two continents. Towns in Brazil—climate of Patagonia compared with that of Ceylon—climate of Falkland Islands? Islands of South America? of North America? Another name for British North America? Where is the Atlantic broadest? Where narrowest? Productions of Cape Colony? Of Australia?

History.—William IV. most particularly—three Reform Bills—dates—by whom passed—Catholic emancipation—questions on Derby—Disraeli—Salisbury—Gladstone.

Arithmetic.—(1) Find by practice the value of 3,819 yards at £4 18s. 9d. each.

£18,856 6s. 3d. Ans.

(2) Make out and receipt the following bill:—

45 lbs. at 3s 0¾d. per lb.
129½ lbs. at 2s. 9½d. per lb.
174 lbs. at 4½d. per lb.

(£6 17s. 9¾d. + £18 1s. 6¼d. + £3 5s. 3d.) = £28 4s. 7d. Ans.

(3) What is the gain on £135 if the gain on every shilling is 3½d.? £36 9s. 2d. Ans.

(4) Add together $2\frac{1}{2}$, $1\frac{3}{4}$, $3\frac{3}{8}$, and divide the result by $\frac{3}{4}$ of $2\frac{1}{3}$. $41\frac{1}{14}$. Ans.

STANDARD VI.

Reading.—'Castles in the Air' from Star Reader.

Essay.—A letter on 'A Ploughing Match' or on 'A Curling Match.'

Arithmetic.—(1) If 25 tons are carried 16 miles for £5 10s. how many tons can be carried 35 miles for £80 10s.? $167\frac{3}{11}$ tons. Ans.

(2) Find the value of ·01875 tons, and reduce 6 acres 1 rood 4 poles to the fraction of 2½ roods.

(a) 1 qr. 14 lbs. (b) $10\frac{1}{5}$. Ans.

(3) At what rate of annual interest will £200 become 221 in 3½ years. 3 per cent. Ans.

History and Geography taken with Standard V. Analysis and parsing taken orally from lines in 'Gray's Elegy.'

Sewing.—According to Schedule—specimens worked in presence of Inspector taken with him.

Publications Received.

BELL, G., & SONS.—Notes on Shakspere's Tempest (*T. Duff Barnett, B.A.*).

BEMROSE & SONS.—Grammar for Pupil Teachers and Middle Class Schools.

BLACKIE & SON.—The Century Readers, No. 5; Blackie's Modern Cyclopædia, Vol. I. (*Charles Annandale, M.A., LL.D.*); The Century Reader Home Lesson Book, No. 4.

CASSELL & CO., LIMITED.—New German Dictionary (*Elizabeth Weir*).

CROSBY & CO.—The Western Grammar, Standards 4 to 7.

CURWEN & SONS.—Juvenile Operetta—The Battle of the Books; School Cantata: Queen Flora's Garden Party (*Cowley*).

DAWSON, A. G.—The Ivy Copy Books, Nos. 1 to 10; Standard Teaching Helps, Part VI. (*H. Major, B.A., B.Sc.*); Bridge's Class Rules; The Certificate Mathematical Guide Series, Part I., Euclid (*H. Wills*).

FISHER UNWIN, T.—The Century Magazine. April.

HEYWOOD, JOHN.—School Management and Method (*Prince*); Grimms' Household Tales (*Gardiner*).

LAURIE, T.—The whole Art of Memory, with key.

LONGMANS & CO.—The Land of my Fathers (*T. Marchant Williams*); Warren's Table Book; Longmans' New Atlas (*Chisholm*).

MACMILLAN & CO.—Elementary Synthetic Geometry (*Dupuis*).

MISCELLANEOUS.—Report on Technical Education—New South Wales (*Edward Combes, C.M.G.*); The Aspirant, No. 192 (*Tildesley & Co.*).

NUTT, DAVID.—Dictionary of Difficulties in French (*Marius Deshumbert*).

SAMPSON, LOW & CO.—Outlines of German Literature (*Mrs. Mody.*)

SIMPKIN, MARSHALL & CO.—Rawle's Practical Geometry.

SMITH, ELDER & CO.—The Cornhill Magazine. March & April.

THE NATIONAL SOCIETY.—Scripture Prints: Christ Walking on the Sea; The Crucifixion. Locke's Thoughts concerning Education (*Rev. Evan Daniel, M.A.*).

THE UNIVERSITY CORRESPONDENCE COLLEGE.—Matriculation Directory, Jan., 1889; B.A. Mathematics: Questions and Solutions, 1881-1888; B.A., 1888, Model Solutions.

THOM, A., & CO.—The Merit Primers.

Query Column.

RULES.

1. Each correspondent is restricted to *one question*. We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher, Pilgrim Street, Ludgate Hill, London, E.C.*

General.

1. A. B.—A and B are fixed points; at a point M forces of given magnitude act along MA and MB; if their resultant is of constant magnitude, shew that M lies on one or other of two equal arcs described on AB as chord.

The point M might be on either side of the line AB.

If the forces be represented in magnitude by MA and MB, then AB will represent the resultant.

If a circle be described through A, B, and M, the point M will lie on the arc described on AB as chord; and it is evident that the arcs will be equal, if M be either above or below AB, as MA and MB are of given magnitude, and consequently must remain the same length, and the angle AMB would be constant.

2. Nelson.—What is the locus of a point whose distances from two given points are in a given ratio to each other? Show that the locus of a point whose distances from three given points are in a given ratio to each other is a circle whose plane is perpendicular to the plane containing the three given points.

(*Science and Art*, 1884, *Fourth Stage.*)

(i) Let A, B be the two given points, and P any point on the locus; also let p. PA = q. PB.

Let the axis of x pass through A and B, and let the co-ordinates of A be a, 0, and those of B be b, 0; also let those of P be x, y.

$$\left.\begin{aligned} \therefore \mathrm{PA}^2 &= (x-a)^2 + y^2 \\ \text{and } \mathrm{PB}^2 &= (x-b)^2 + y^2 \end{aligned}\right\}$$

$$\therefore p^2[(x-a)^2 + y^2] = q^2[(x-b)^2 + y^2],$$

$$\text{or } (p^2 - q^2)x^2 - 2x(ap^2 - q^2b) + (p^2 - q^2)y^2 + p^2a^2 - q^2b^2 = 0;$$

But since the co-efficient of x^2 and y^2 are similar, and the term xy is not involved, this is the equation to a circle, the centre of which is in the axis of x at a distance of $\frac{p^2a - q^2b}{p^2 - q^2}$ from the origin.

(ii) Let A, B, C be the three given points, and P any point on the locus; also let

p. PA = q. PB = r. PC.

Take the plane through A, B, and C as the plane of xy, and let a straight line passing through A and B be the axis of x, and one passing through C at right angles to AB the axis of y.

Let the co-ordinates of A be a, 0, 0;
" " B " b, 0, 0;
" " C " 0, c, 0;
" " P " x, y, z.

$$\left.\begin{aligned} \therefore \mathrm{PA}^2 &= (x-a)^2 + y^2 + z^2 \\ \mathrm{PB}^2 &= (x-b)^2 + y^2 + z^2 \\ \text{and } \mathrm{PC}^2 &= x^2 + (y-c)^2 + z^2 \end{aligned}\right\}$$

$$\therefore p^2[(x-a)^2 + y^2 + z^2] = q^2[(x-b)^2 + y^2 + z^2] \quad (1)$$

$$\text{and } q^2[(x-b)^2 + y^2 + z^2] = r^2[x^2 + (y-c)^2 + z^2] \quad (2)$$

Treating these equations as simultaneous, we get

$$\frac{2x(ap^2 - bq^2) - a^2p^2 + b^2q^2}{p^2 - q^2} = \frac{2xbp^2 - 2ycr^2 - b^2q^2 + c^2r^2}{q^2 - r^2}, \quad (3)$$

both these expressions being equal to $x^2 + y^2 + z^2$; but this is the equation to a plane, which is at right angles to the plane of xy, since the co-efficient of z is 0.

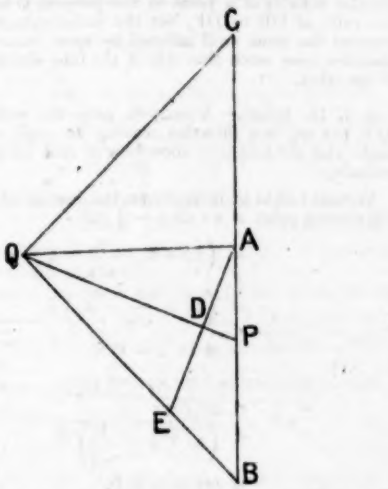
But (1) and (2), since the co-efficients of x, y, z are similar, and the terms xy, xz, and yz are not involved, are the equations to spheres.

The section of a sphere and a plane is a circle.

Therefore from (1) and (3) or (2) and (3) the locus of the point is a circle in the plane which is at right angles to the plane of xy, in which we supposed the given points to be.

The Geometrical proof of (i) is very instructive.

Let A, B be the points, and let AB be divided in P, so that p. PA = q. PB, or PA : PB = q : p, the given ratio.



Draw any straight line PQ, and on it draw the perpendicular AD; produce AD to E, so that DE = AD.

Join BE, and produce it to meet PQ in Q.

Then Q shall be a point on the locus.

Join AQ.

Since the angles at D are right angles, and AD = DE, the triangles PDA and PDE are equal in all respects.

$\therefore \angle$ AQD = $\angle$ EQD, or QP bisects the angle AQB of the triangle QAB.

$\therefore$ QA : QB = PA : PB, (vi. 3.) = q : p.

Wherefore Q is a point on the locus.

At the point Q make the angle PQC equal to the angle QPC, C being in BA produced.

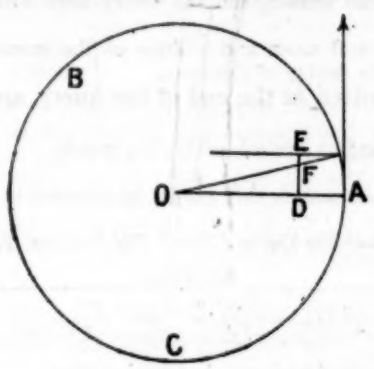
$\therefore$ CQ = CP, and we shall prove that the position of C is independent of the direction of PQ, and that the locus of P is a point at a constant distance from C, or a circle of which C is the centre.

Since $\angle$ CQP = $\angle$s CQA, AQP, and $\angle$ CPQ = $\angle$s PBQ, BQP, $\therefore \angle$s CQA, AQP = $\angle$s PBQ, BQP; but $\angle$ AQP = $\angle$ BQP, $\therefore \angle$ CQA = $\angle$ PBQ; and the angle at C is common to the two triangles CQP and CBQ, therefore these triangles are similar.

$\therefore$ CA : CQ = CQ : CB, (vi. 4.) but CP = CQ, $\therefore$ CA : CP = CP : CB.

But A, B, and P are all fixed points; therefore C is independent of the position of PQ.

3. J. RATTRAY.—Suppose that at the equator a straight hollow tube were thrust vertically down towards the centre of the earth, and that a heavy body were dropped through the centre of such a tube, it would soon strike one side. Find which side it would strike, giving a reason for your reply.



Let ABC be the equatorial section of the earth taken as the plane of the paper, and let the North Pole be above the paper.

The body has a uniform circular velocity of 1000 miles an hour which it receives from the motion of the earth, and an accelerating velocity (g) towards O.

After the body has moved a short distance, say to D, the circular velocity of a point in the plane at D has decreased in the ratio of DE to DF, but the initial velocity of the body remains the same until affected by some other body. It will therefore soon reach that side of the tube which moves in front of the other.

4. J. H. JONES.—A body is projected with a velocity of $2g$ ft. per sec. in a direction making an angle of half a right angle with the horizon; show how to find its place after two seconds.

Vertical height of body above the horizontal plane through the starting point $= u t \sin \alpha - \frac{1}{2} g t^2$

$$= \left(2g \times 2 \times \frac{1}{\sqrt{2}} - \tfrac{1}{2} g \times 2^2\right) \text{ft.}$$

$$= \left(4g \times \frac{1}{\sqrt{2}} - 2g\right) \text{ft.}$$

$$= 2g(\sqrt{2} - 1) \text{ft.}$$

Horizontal distance from starting point

$$= u t \cos \alpha$$

$$= \left(2g \times 2 \times \frac{1}{\sqrt{2}}\right) \text{ft.}$$

$$= (2g \times \sqrt{2}) \text{ft.}$$

$\therefore$ Distance from starting point

$$= \sqrt{[2g(\sqrt{2} - 1)]^2 + (2g \times \sqrt{2})^2} \text{ ft.}$$

$$= 2g\sqrt{(\sqrt{2} - 1)^2 + (\sqrt{2})^2} \text{ ft.}$$

$$= 2g\sqrt{2 - 2\sqrt{2} + 1 + 2} \text{ ft.}$$

$$= \underline{2g\sqrt{5 - 2\sqrt{2}} \text{ ft.}}$$

5. W. HUGHES.—Both your solutions are correct, and the answer should be £97 18s. 4d.

6. R.B.—Jevon's Logic Primer is published by Macmillan, price 1s. Dr. Coupland's Mental and Moral Science, published by J. Hughes, price 2s. 6d. We would recommend Hallam's Constitutional History.

7. H.W.—We believe no translation is published, or is likely to be.

8. MARK OF FRIENDSHIP.—The Large hand is not good. The letters are too upright. Curves are not properly shaped. The straight strokes are not equally inclined. *To.* The small hand is neat, legible, and uniform. None of the letters are really well-made. It entirely lacks finish. You need steady practice with good copies.

9. STUDENT.—The diploma is a certificate in which some account is given of the knowledge and abilities of its owner. Any information you may require can be obtained from the Secretary of the College of Organists, Queen's Square, Bloomsbury.

10. VYKING.—You will do well to take in the paper called 'Farm and Home.'

11. FABIOLA.—Of course we like to help those who try to profit by it. We would strongly advise him to begin with Smith's Initia Græca. Write the exercises out carefully. You can procure the key if you are a *bona-fide* student, which will enable you to correct some of your mistakes. When you have got as far as the verbs, buy Rushbrook's First Greek Reader. With those two books you ought to be able to make sound progress.

12. SUTTON.—You are not likely to have mixtures which present unusual difficulties. At the same time you should be thoroughly well grounded in the principles of Analysis. All the better books will show you how you may remove the Phosphoric Acid entirely, if you wish to do so. Students who work much by themselves are in the habit of attempting to analyse difficult mixtures before they have thoroughly understood the methods of separation. We will recommend you manuals if you wish it.

13. SINON.—We agree with you that Newcastle is the capital of Northumberland.

14. W. LEROY.—For Geography try Lawson's, 3s. 6d., by Simpkin and Co. Hall and Knight's Algebra and Hall and Knight's Euclid are both published by Macmillan, 4s. 6d. each.

15. SELSEY BILL.—Dunstan's Music contains all you want in both notations. Use Johnston's or Phillip's Atlas. Physical Geography, Hughes, price 3s. 6d., published by Longmans, Green and Co. History for special period, G. Phillip and Son, 32 Fleet Street, price 2s. 6d.

16. A. S.—We merely give you our opinion. Algebra, Todhunter's or C. Smith's, by Macmillan and Co. Geometry, Mackay and Wilson's Solid Geometry, Smith's Co-ordinate Geometry. Lock's Statics and Dynamics.

17. JEFIRMIN.—Large hand original, and in this case wrong. If you buy a book containing good copies, and practise them every day, in the course of a year or so you will write a good hand. Until several of the letters are properly shaped, it seems of little use to point out mistakes in detail. Don't be discouraged, but work. At present small hand can only be described as altogether bad.

Mensuration.

1. SURVEYOR.—Three perpendiculars upon the sides of an equilateral triangle from a point within are 2070, 1630, 2900 links; find the area of the triangle.

$$\text{Area} = \frac{\text{side}}{2}[(2070 + 1630 + 2900) \text{ links}]$$

$$= (\text{side} \times 3300) \text{ sq. links;}$$

$$\text{Area of equilateral triangle} = \frac{\text{side}^2}{4} \times \sqrt{3};$$

$$\therefore \frac{\text{Side}^2}{4} \times \sqrt{3} = \text{side} \times 3300$$

$$\text{Side} \times \frac{\sqrt{3}}{4} = 3300$$

$$\therefore \text{Side} = \left(3300 \times \frac{4}{\sqrt{3}}\right) \text{links}$$

$$= \frac{13200}{\sqrt{3}} \text{ links.}$$

$$\text{Area} = (\text{side} \times 3300) \text{ sq. links.}$$

$$= \left(\frac{13200}{\sqrt{3}} \times 3300\right) \text{ sq. links}$$

$$= \frac{13200 \times 3300 \times \sqrt{3}}{3} \text{ sq. links}$$

$$= 14{,}520{,}000\sqrt{3} \text{ sq. links}$$

$$= (145{\cdot}2 \times \sqrt{3}) \text{ acres}$$

$$= (145{\cdot}2 \times 1{\cdot}73205\ldots) \text{ acres}$$

$$= \underline{251{\cdot}493\ldots \text{ acres. Ans.}}$$

Algebra.

1. ZENOCRATES.—If $a : b :: c : d$, show that the following relation is true

$$\frac{pa^2 + qab + rb^2}{la^2 + mab + nb^2} = \frac{pc^2 + qcd + rd^2}{lc^2 + mcd + nd^2}.$$

(*Todhunter's* 'Algebra for Beginners.')

$$\frac{a}{b} = \frac{c}{d}; \quad \therefore \frac{pa}{b} = \frac{pc}{d};$$

$$\frac{b}{a} = \frac{d}{c}; \quad \therefore \frac{rb}{a} = \frac{rd}{c};$$

$$\therefore \frac{pa}{b} + \frac{rb}{a} = \frac{pc}{d} + \frac{rd}{c},$$

$$\frac{pa}{b} + q + \frac{rb}{a} = \frac{pc}{d} + q + \frac{rd}{c},$$

$$\frac{pa^2 + qab + rb^2}{ab} = \frac{pc^2 + qcd + rd^2}{cd}.$$

Similarly it can be shown that—

$$\frac{la^2 + mab + nb^2}{ab} = \frac{lc + mcd + nd^2}{cd};$$

$$\therefore \frac{pa^2 + qab + rb^2}{ab} \times \frac{ab}{la^2 + mab + nb^2} = \frac{pc^2 + qcd + rd^2}{cd} \times \frac{cd}{lc^2 + mcd + nd^2},$$

Wherefore $\frac{pa^2 + qab + rb^2}{la^2 + mab + nb^2} = \frac{pc^2 + qcd + rd^2}{lc^2 + mcd + nd^2}$

2. GRADUATE.—Two partners, A and B, gained £140 by trade; A's money was three months in trade, and his gain was £60 less than his stock; and B's money, which was £50 more than A's, was in trade 5 months. What was A's stock?

Let x = A's stock in pounds,

Then $x + 50$ = B's ,, ,, ;

$$\therefore 3x + 5(x + 50) : 3x :: 140 : x - 60$$

$$(8x + 250)(x - 60) = 3x \times 140$$

$$8x^2 - 230x - 15{,}000 = 420x$$

$$8x^2 - 650x = 15{,}000$$

$$x^2 - \frac{325x}{4} = 1{,}875$$

$$x^2 - \frac{325x}{4} + (\tfrac{325}{8})^2 = 1{,}875 + \tfrac{105625}{64}$$

$$= \frac{120000 + 105625}{64}$$

$$= \tfrac{225625}{64}$$

$$x - \tfrac{325}{8} = \pm \tfrac{475}{8}$$

$$\therefore x = \pm \tfrac{475}{8} + \tfrac{325}{8}$$

$$= 100, \text{ or } -\tfrac{75}{4}.$$

$\therefore$ A's stock = £100. Ans.

3. COMPOS.—Given log 648 = 2·81157501 and log 864 = 2·93651374, find log 3 and log 5. (*Todhunter.*)

$$648 = 2^3 \times 3^4;$$

$$864 = 2^5 \times 3^3;$$

$$\left.\begin{aligned} 3\log 2 + 4\log 3 &= 2{\cdot}81157501 \\ 5\log 2 + 3\log 3 &= 2{\cdot}93651374 \end{aligned}\right\}$$

$$\left.\begin{aligned} 15\log 2 + 20\log 3 &= 14{\cdot}05787505 \\ 15\log 2 + 9\log 3 &= 8{\cdot}80954122 \end{aligned}\right\}$$

Subtracting] $11\log 3 = 5{\cdot}24833383$

$$\therefore \text{Log } 3 = {\cdot}47712125.$$

$$\left.\begin{aligned} 9\log 2 + 12\log 3 &= 8{\cdot}43472503 \\ 20\log 2 + 12\log 3 &= 11{\cdot}74605496 \end{aligned}\right\}$$

Subtracting] $11\log 2 = 3{\cdot}31132993$

$$\therefore \text{Log } 2 = {\cdot}30102999.$$

$$\text{Log } 5 = \log \tfrac{10}{2}$$

$$= \log 10 - \log 2$$

$$= 1 - {\cdot}30102999$$

$$= 69897001.$$

4. INKERMAN.—Show that

$$p_0 + p_1x + p_2x^2 + \ldots + p_nx^n$$

may be divided by $x + a$ with a remainder

$$p_0 - p_1a + p_2a^2 - \ldots \pm p_na^n.$$

Hence determine when $x^n + 1$ is divisible by $x + 1$.

(*Jones and Cheyne.*)

$$\frac{p_0 + p_1x + p_2x^2 + \ldots + p_nx^n}{x + a} = Q + \frac{R}{x + a},$$

$$\therefore p_0 + p_1x + p_2x^2 + \ldots + p_nx^n = Q(x + a) + R,$$

for x write $(-a)$,

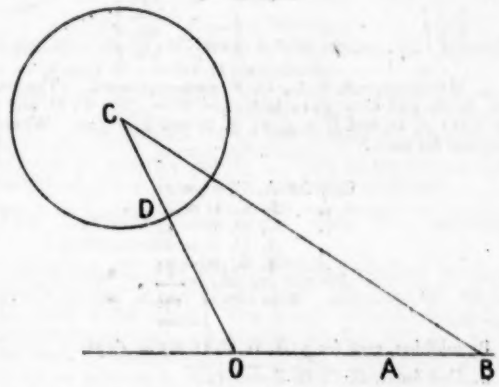
$\therefore p_0 - p_1a + p_2a^2 - \ldots \pm p_na^n = R$, according as n is even or odd.

Hence $\frac{x^n + 1}{x + 1} = Q + \frac{R}{x + 1}$,

and $R = (-1)^n + 1$, which = 0 when n is odd, and 2 when n is even.

Geometry.

1. NONDESCRIPT.—Describe a circle which shall touch a given circle, have its centre in a given straight line, and pass through a given point in the given straight line. (*Todhunter.*)



Let C be the centre of the given circle, and A the given point in the given straight line.

On this straight line take AB equal to the radius of the given circle.

Join BC, and at C draw the radius CD, making the angle BCD equal to the angle CBA, and one the same side as CB.

Produce CD to meet the given straight line at O.

Then O shall be the centre of the required circle.

Proof.—$\angle OCB = \angle OBC$, (Con.)

$\therefore OC = OB$; (I. 6.)

and AB = CD, (Con.)

$\therefore OA = OD$.

Wherefore the circle described from the centre O with the radius OA will touch the given circle at D.

Q. E. F.

Note.—No.

Arithmetic.

1. M. R.—A person insures his life for a certain sum at a yearly premium of £25. Immediately after the fourth payment he dies, and the loss to the company, reckoning money worth 5 per cent. compound interest, is estimated at £692 4s. 11½d. What was the sum insured?

(*Certificate Examination, Females, 2nd Year, Scotland*, 1888.)

	£	s.	d.
First premium =	25		
First year's interest =	1	5	
Second premium =	25		
	51	5	
Second year's interest =	2	11	3
Third premium =	25		
	78	16	3
Third year's interest =	3	18	9¾
Fourth premium =	25		
	107	15	0¾
Company's Loss =	692	4	11½
∴ Insurance =	£800	0	0 Ans.

2. W. H. P.—In what proportions must wines of 15s., 20s., 26s., and 30s. a gallon respectively be mixed, so as to give a profit of 14⅔ per cent. on the cost, when sold for 24s. a gallon? (*Civil Service Arithmetic.*)

$$\text{£}\ 114\tfrac{2}{7} : \text{£}\ 24 :: \text{£}\ 100 : \text{Cost price of mixture.}$$

$$\frac{7}{800} \qquad 3$$

$$= 21\text{s.}$$

Gain per gal. on 1st kind at this price = 21s. − 15s. = 6s.,
" " 2nd " " = 21s. − 20s. = 1s.,
Loss " 3rd " " = 26s. − 21s. = 5s.,
" " 4th " " = 30s. − 21s. = 9s.;

∴ Gain per gal. on 1st kind × 5 = Loss per gal. on 3rd kind × 6,
" " " × 9 = " " 4th " × 6,
" " 2nd " × 5 = " " 3rd " × 1,
" " " × 9 = " " 4th " × 1;

∴ Proportion = 5 gals. @ 15s.
9 " 20s.
6 " 26s.
1 " 30s.
or, 9 " 15s.
5 " 20s.
1 " 26s.
6 " 30s.

3. MAGISTER.—A, B, C, D, E were supported. The cost for A, B, and C = £21; B, C, and D = £27; C, D, and E = £32; A, D, and E = £28; A, B, and E = £24. What is the cost for each?

	£
Cost for A, B, C =	21
" B, C, D =	27
" C, D, E =	32
" A, D, E =	28
" A, B, E =	24
	132

By addition, cost for 3 (A, B, C, D, E) = £132,
∴ Cost for A, B, C, D, E = £44;
Cost for 2A, B, C, D, E = £21 + £28 = £49;
∴ Cost for A = £49 − £44 = £5.
Cost for C, D, E = £32,
∴ Cost for B = £44 − £5 − £32 = £7.
Cost for C = £21 − £5 − £7 = £9;
" D = £27 − £7 − £9 = £11;
" E = £32 − £9 − £11 = £12.

4. T. H. M.—Find the discount on the following, omitting fractions of a penny:—£4,000 from October 18th to November 16th, at 6 per cent. (*Hamblin Smith.*)

No. of days allowing three days of grace
= 13 + 16 + 3 = 32;

Interest on £100 for the time = £6 × $\frac{32}{365}$
= £$\frac{192}{365}$;

∴ £ $100\frac{192}{365}$: £ 4,000 :: £ $\frac{192}{365}$: True Discount.

$$= \frac{4000 \times \overset{48}{\cancel{192}}}{\underset{9173}{\cancel{365}\cancel{692}}}\ \text{£}$$

$$= \frac{48000}{9173}\ \text{£}$$

$$= \text{£}20\ 18\text{s.}\ 7\text{d. Ans.}$$

Banker's Discount = 6 % on £4,000 × $\frac{32}{365}$

$$= \text{£}240 \times \frac{\overset{48}{\cancel{32}}}{\underset{73}{\cancel{365}}}$$

$$= \frac{11520}{73}\ \text{£}$$

$$= \text{£}21\ 0\text{s.}\ 10\text{d. nearly. Ans.}$$

5. F. PALMER.—A person, after paying 7d. in the £ for income tax, and 3½ per cent. on a mortgage of £4,000, has £1,568 13s. 4d. remaining: what was his rental?
(*Barnard Smith.*)

Interest for mortgage = 3½ % on £4,000
= £40 × 3½
= £140;

Amount left after paying income tax
= £1,568 13s. 4d. + £140
= £1,708 13s. 4d.;

s. d.	£	s. d.	£	
∴ 19 5	: 1,708	13 4	:: 1	: Rental.

12 20
233 34173
12
£
)410080(1,760
233
1770
1631
1398
1398

∴ Rental = £1,760. Ans.

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Publications Reviewed.

The Queen Primer Reading Sheets. London and Edinburgh: T. Nelson and Sons.

These sheets are among the largest published, being forty inches in length, by thirty-two in breadth. They are twelve in number, and contain the alphabet both capital and small letters, and easy lessons in the use of short vowels and words. They may be used with any series of primers but are specially prepared to accompany the Queen Primers. Printed in clear bold type on good stout parchment paper they are calculated to stand hard school usage. We notice the introduction of a very difficult capital letter in one of the lines of script which occupy the space at the bottom of ten of the sheets. It is the more noticeable as it is the only one on the sheets.

A Practical French Grammar. By C. O. Sonntag. London: Blackie and Son.

The fourth part of this grammar is to hand and all the parts bound together are also issued. The book will take a foremost place in the list of elementary French grammars on account of the practical character of its lessons, the scientific manner in which they are built up, and the numerous exercises it contains. Although the grammar does not provide a very extensive vocabulary, good use is made of the words it introduces by their employment in various forms, and the scholar is constrained to think in French, and thus has a good introduction to composition as well as being rendered familiar with the pronunciation of words through their frequent recurrence. As on previous occasions when examining the earlier parts, so an acquaintance with the complete volume enables us to recommend it as thoroughly practical and therefore well worthy of the name it bears.

English Composition and How to Teach it. By Robert S. Wood. New and Enlarged Edition. London: A. G. Dawson.

This is a thoroughly practical work, which abounds in hints and suggestions that cannot fail to be useful to any one who seeks its guidance in the difficult task of teaching to children and young students the elements of English Composition. The book is evidently no hasty compilation: it shows signs rather of being the outcome of

practical experience, combined with a remarkable readiness in assimilating sound teaching on the subject from all sorts of authorities, and in making the results of careful and extensive research easily available for others. Various methods of making lessons in composition interesting and effective are described in detail and illustrated by examples. Indeed, it would almost seem as if no conceivable device for overcoming difficulties, and no possible form of exercise for practice, had been overlooked by the author. The volume, it will be understood, is not intended for scholars, but it is pre-eminently a book for the practical teacher. In addition to sound and systematic advice on oral and narrative composition, we find the essential rules of a simple English style clearly stated and abundantly illustrated. The observations on Essay Writing are followed by a considerable number of analytical outlines, and a long list of subjects which have been given in various examinations.

Scholarship Questions, 1887 and 1888, with Hints and Answers to the Grammar Questions, and full Solutions to Questions in Arithmetic, Algebra, Euclid and Mensuration. London: National Society's Depository.

This is a reprint, in pamphlet form, of the questions set at the Admission Examination for the last two years, with hints, answers, and solutions to certain portions of the papers. The solutions of the mathematical questions will serve as good models for candidates. The tests in parsing and analysis are worked out fully, but beyond these, the help given in grammar is rather meagre. The hints consist frequently—no less than four times on one page—of references to various works published by the National Society. If, in this notice, we were to imitate this form of advertising, we might call attention to the full answers given in the pages of this journal, not merely to the mathematical and grammatical questions, but to the whole of the Scholarship papers.

The Realistic Elementary Geography. By W. G. Baker, M.A. London: Blackie and Son.

The thought and ability which have been exercised and developed in the making of text books of geography, manifest an advance far beyond that seen in the production of the majority of our English atlases. This book is a good example of still further advance. The value of picture, diagram, plan, map, and model, is recognised on almost every page, and as a result we have a very attractive little book. It forms a most useful introductory volume to the general study of geography.

Ivy Copy Book. Ten Nos. London: A. G. Dawson, Ivy Lane.

This is a good, cheap series of copy books. It consists of ten numbers carefully graduated, with round, clear writing. Each book has sixteen pages, and is sold for a penny. Notwithstanding the lowness of the price, the paper is very good, and the writing does not show through. The books have all the good features of copy books sold at a higher price.

Commercial Geography. By Dr. Carl Zehden, translated by Findlay Muirhead, M.A. London: Blackie and Son.

This book appears at a most opportune moment; the question of commercial education is rapidly becoming urgent and will soon demand the best attention of every educator of youth. The design of the work before us is to furnish an explanation of the agricultural, industrial, and commercial circumstances, and of the wealth of each country deduced from its climate, the nature of its surface, the character of its people and its animal, vegetable, and mineral productions. It has already reached a fifth edition and makes its appearance as an English text book, therefore, with abundant claims to our thoughtful consideration. We have tested the accuracy of these 700 pages at many points with the most satisfactory results. The matter is arranged on a thoroughly sound and rational plan. It is evidently the work of an educationist as well as a most painstaking geographer. We heartily welcome this English edition and predict it a widespread reception.

Standard Teaching Helps: Standard III. By H. Major, B.A. London: A. G. Dawson, Ivy Lane.

This is a book built on similar lines to those already noticed in these columns. It contains numerous hints on the best methods of teaching all the subjects taken by Standard III. The model lessons, the notes of lessons, the questions given by Her Majesty's Inspectors, the remarks from the Blue Books, the time tables, the exercises in singing and drawing, are all helpful, and every pupil teacher and assistant who takes Standard III. for the first time, will find something in it of practical utility.

Ladies' Daily Conduct Register of Marks. Manchester: John Heywood.

This is a small octave book ruled for daily marks for conduct and work in the various subjects which we expect to find in the routine of a girls' school. Each page is adapted for a week's entries. Where marks form a chief feature of school discipline it will be found handy.

The Century Readers: No. V. London: Blackie and Son.

This volume is marked by similar features to those which gained approval in these columns for earlier numbers of the series. The matter is fresh, interesting, well-arranged, and very suitable for the class for which the book is intended. Many of the subjects occupy two or three lessons in succession, and thus the interest is better maintained than it can be when every lesson in a book is entirely disconnected from the rest. In the latter half of the volume we have a continuous story of adventure, 'The Golden Hind,' abridged from one of Mr. Henty's popular works. This exciting tale, which extends to nearly a score of chapters, is sure to prove attractive to boys. The poetry is judiciously selected, and though it has not been possible to avoid uniformly, as in the case of the prose lessons, pieces found in other readers, a considerable number of fresh poems have been introduced. Dictation and grammar tests, lists of words for revisal, and notes on meanings are abundant. Several pieces for recitation, with simple annotations are appended, and the book closes with a course of grammar lessons and tests in music.

Practical Papers in Higher Arithmetic. By G. E. Skerry, F.R.S.L. London: Skerry & Co., Chancery Lane.

These papers occupy seventy-four pages, and deal with such subjects as Scales of Notation, Casting out the Nines, Combination of Ratios, Chain Rule, the theory of the rules for G.C.M., L.C.M., Fractions, Recurring Decimals, and other difficulties, often met with in Competitive Examination Papers. The explanations are full and clear, and pupil teachers and assistants would find in the book matter of great service, but which is not always found in ordinary books of arithmetic.

The Charterhouse Oxford and Cambridge Atlas. London: Relfe Brothers.

This Atlas has been prepared to show all the principal towns, rivers, mountains, and *places* mentioned in the 'Oxford and Cambridge geography.' The maps have the decided advantage of being on a larger scale than usual.

The Chinaman: The Japanese Fan: Merry Little Maids, and Merry Little Boys. Action Songs for School Concerts: Words and Music by A. L. Cowley. London: Curwen and Sons.

These are three numbers of Messrs. Curwen's shilling series of folio songs with pianoforte accompaniment. They are well-written, easy and pleasing, and all within the average range of children's voices. Of the three, 'the Japanese Fan' is undoubtedly the best, being just the thing to 'go well' at a school concert. We do not admire the *consecutive octaves* between bass and melody in last bar, page 3, of 'Merry Little Maids, &c.': but otherwise it is a good, lively song.

Dates made Easy: a Mnemonic Synopsis of the History of England. By John Hugh Hawley, M.C.P. London: Relfe Brothers.

This booklet is intended for the help of those who find the remembering of dates an insuperable difficulty in their study of history. The author has contrived a simple and ingenious mode of associating the figures of dates with the letters of the alphabet, so that sentences framed in accordance with the system shall suggest the event and embody the date. The scale can be learnt with little trouble, but we scarcely think the learning of the mnemonic sentences would be found an easy task. Indeed we cannot but regard the uncouth combinations of words in which the scale constrains the author to state his facts as more of a bugbear than the dates themselves. And for any one who has an ear for good English to have such sentences echoing in his memory might be deemed a greater evil than that he should be doubtful about the dates of events. Here are some examples:—'Becket murdered by Tracey and Company' (1172). 'Beaufort the feeble child instructs.' 'Simnel to falconer from Kitchen translated.' 'Paul's then executed by Wren.' 'Britain timed by Gregory's calendar.' 'The Tale of Waverley Masterly finished.' 'Begun was the "Times" worthy of Walter.' 'Chloroform wielded for fending off torture.' 'Albert the Wise summoned above.' This last sentence intimates that the death of the Prince Consort took place in 1862. If any student, trusting to his remembrance of these sentences, should unfortunately forget the order of the words, or substitute a synonym, all the advantage of the system will be lost.

The Student's Atlas. By Richard A. Procter. London: Longmans Green and Co.

At last we have something original and instructive in the form of an English atlas. During the past dozen years innumerable issues of the same style of map have been published, each following the same pattern and none showing the slightest advance. The maps before us present the various physical and political features of the globe in an entirely new and most instructive grouping. It is a positive delight to see old geographical friends presented in these new relationships. The author's aim has been to present clear and exact ideas of the relations which different parts of the earth's surface bear to one another, and in order to secure this object each of the twelve maps has been drawn to the same scale and none has been crowded with unnecessary names.

Passages for Translation into Greek. By T. Y. Sargent, M.A. (Clarendon Press Series.)

This is a collection of English passages, some original, some translations, put together much in the same way as the well known 'Easy Passages for Latin Prose Translation,' by the same editor. Only in the present case the exercises are arranged more precisely according to their difficulty, the book being divided into a first and second part. In the former, the pieces are mostly translations from Greek originals, and a certain amount of help is given in footnotes. In the second part, the learner has to deal with extracts from English authors, and to rely upon his lexicon alone for any help beyond that which his own reading can give him. By a useful arrangement the passages are divided according to their subject, under the heads of Narrative, Platonic, and Rhetorical. The book is well contrived, but goes too far or not far enough. The very easy pieces with which it begins are too few to form a sufficient preparation for the harder exercises which follow; and the footnotes, which are no more than a vocabulary of words and phrases, do not do for the beginner what he most needs—by making easy for him the step from a verbal knowledge of the laws of Greek syntax to the application of them in the practice of Greek composition.

Petit Théâtre des Enfants: Twelve Tiny French Plays for Children. By Mrs. Hugh Bell. London: Longmans, Green and Co.

Wherever small plays adapted to the intelligence of young children are required, the above collection will be welcome. They are written in easy, yet idiomatic French; they are all short and bright, and the repartee in them neither far-fetched nor obstruse. For learning by heart in junior classes these little plays will be found much more suitable and more interesting to the pupils than many of the selections of poetry which are often used. The latter often are either beyond the comprehension of young children, or hopelessly jejune in form and matter. The plays are equally well adapted for recitations in the junior classes.

Illustrations of the Locomotive Engine. Two Diagrams. London: A. Johnston.

Machinery of all sorts and sizes enters so largely into modern every day life that some slight knowledge of the principles and working of the most common types is becoming almost a necessity. The steam engine in its various forms is of course the type *par excellence*, for in one shape or another we are constantly brought face to face with it. We see it in our ships doing the work of 10,000 horses, on our roads actuating colossal stone-crushing rollers, in our factories turning hundreds of feet of shafting, in our fields driving ploughs and thrashing machinery, and last but not least on our railways in the form of 1000 horse-power locomotives. It is therefore with much pleasure we note the advent of these two wall diagrams illustrating this last mentioned application of steam power. The engine illustrated is not one of those high-pressure compounds of the Webb or the Worsdell type so well known on the London and North Western and Great Eastern Railways, but rather one specially concocted to show the rationale of working in its simplest state. In diagram No. 1 the engine is shown in its entirety, and by means of suitable gaps in the outer iron casing, views are given of the interior so that we can follow out the main points of the working economy. Thus we can trace the course of the flames and heat from the fire-box through the boiler tubes into the smoke-box and out into the open air through the chimney. We can look into the boiler and follow the steam from the steam-dome through the steam-pipe and steam-chest into the cylinder. We can see how it acts on the piston, and how the movement given to the piston-rod and connecting-rod drives the crank of the driving-wheel and actuates the valve motion which opens and shuts the various ports in the steam-chest, thus securing the necessary out and in stroke of the piston-rod.

As has been already said, various modifications have been adopted in the mechanism shown, with a view to securing simplicity of detail; and although some of these departures from usual practice—such as the omisssion of springs, the absence of coal supply, cabin, and guard rails for the driver, &c.—may seem of somewhat questionable advantage, there is no doubt these two wall diagrams will afford the material for very instructive and interesting lessons on the working of a locomotive engine.

Diagram No. 2 gives enlarged views of the cylinder and working parts. The descriptive letterpress appended to each drawing is clear and concise, although in some respects the terms employed vary from the nomenclature in common use. As examples we may mention that a coupling-rod is called a 'joining rod,' while 'sliding-valve' does duty for slide-valve, and the word 'ventilator' is applied both to the regulator at the dome end of the steam-pipe and to the various safety valves.

The Jubilee Drawing Copy Books. London and Derby: Bemrose and Sons.

Seventeen numbers at two-pence each make up this series of Drawing Books. As the name implies, they include copies and paper for drawing upon. Some of the numbers are very good, and great variety, both of subject and treatment, is found in them; but in others the graduation is not always perfect, and in the model books the drawing is not always correct. Many of the designs are original, while others have done duty in the Drawing Examinations of the Science and Art Department for years past. Many of the copies and subjects are still in use at the yearly examinations. The paper is good, and suitable for drawing upon, and with the exceptions named the whole series is worthy of a place among the books published to suit the requirements of the drawing syllabus.

Hints on English Composition. By John Keefe. London: Simpkin, Marshall & Co.

In the form of a brief pamphlet Mr. Keefe, an experienced Civil Service tutor, gives a number of concise and useful hints on the study and practice of composition as required by candidates for Civil Service and other examinations. Punctuation and grammatical rules are glanced at, and the chief characteristics of a good style are described and briefly exemplified. A list of books likely to prove useful in the formation of style and for purposes of reference is given. It seems a pity that these were not classified instead of being so thoroughly mixed. Books most useful for reference might at least have been separated from those which afford the best samples of style. The last few pages are occupied with lists of subjects for essays proposed at recent examinations.

Longmans' School Arithmetic. By F. E. Marshall, M.A., and J. W. Welsford, M.A. London: Longmans, Green & Co.

After a careful examination of Longmans' 'School Arithmetic' we have no hesitation in recommending it as a capital text-book. It is distinguished by the well-arranged sequence and clearness of the explanations, by the introduction of abundant oral exercises at every opportunity, by the ingenious devices for securing almost inexhaustible practice in elementary computation, by the use of graphic delineation to illustrate principles and explanations wherever this course can be made advantageous, as in the rules for dealing with vulgar fractions, and in those relating to areas and volumes, and by the completeness with which commercial rules are treated.

We have been struck particularly with the squares of digits arranged under the four fundamental rules for practice in rapid calculation of various kinds, and by the simple, straightforward directions for attaining speed and accuracy in such calculation. 'Don't say "carry 3," do it,' is an example of good advice forcibly expressed.

The Unitary method of working is used throughout the book, but a chapter on Ratio and Proportion deals with those subjects very effectively. In the part devoted to Commercial Arithmetic, we notice separate sections on Rates and Taxes, Bankrupt's Estate, Banker's Discount, Equation of Payments, Annuities; and on every section numerous exercises are founded. The last chapter deals with problems arranged under the heads of Averages and Mixtures, Work and Time, Velocity, Relative Velocity, and Handicaps, &c.

The use of Brackets is explained in the course of the first few pages, and without unduly encroaching on the province of Algebra, useful terms and expressions are introduced for generalising explanations and results.

An Appendix of Notes explains the bearing on Arithmetic of some Algebraical proofs, and the relation of Arithmetic to some scientific points. Fifty pages of Examination Papers and Miscellaneous Exercises conclude what appears to us an excellent work.

Some idea of the remarkable copiousness of the exercises may be formed from the fact that the answers alone occupy 72 fully printed pages. The volume is supplied with or without these without difference of price.

La Belle-Nivernaise; the Story of a River-barge and its Crew. By Alphonse Daudet.

Bug-Jargal. By Victor Hugo. Edited by J. Boïelle, B.A. (Univ. Gall.). London: Whittaker and Co.

We fully agree with the editor when he says in his preface that 'La Belle-Nivernaise' may almost be looked upon as an ideal reading-book for junior forms, but he ought to have added, namely, for such junior forms where the pupils have enough insight into the structure of their own language or of Latin, to study French intelligently. For the nursery-system of teaching French the book would not do. There is a complete French-English vocabulary at the end, so that the pupils do not require a dictionary. The notes are good and supply renderings of a less foreign flavour than one usually meets with in books of this class. We only came across an occasional slip in looking through them; for instance, *On se lasse un peu*, One packs a little closer. This is not English.

Victor Hugo's Bug-Jargal may be recommended as a reader for middle forms. Written at the age of sixteen, it foreshadows all the qualities of style with which his maturer prose works are stamped. The words or expressions in the text which have notes in the appendix in both these editions are marked with asterisks. This is an excellent device. The innate capacity of the ordinary school-boy for scamping his home-lessons is but too well known to every teacher. Unless he is quite sure to find a note, he will often be content with a wrong rendering rather than take the trouble to see if perchance the notes give him any light in his darkness. In these books his ever-ready excuse, 'I quite forgot to look in the notes,' is cut away from under his feet.

Matriculation Directory. University Correspondence College.

This Manual has now grown to a volume of 133 pages. Besides an excellent selection of books suitable for the study of all the subjects mentioned in the syllabus it contains a set of examination papers together with the answers to them worked out in full. These answers are well done and in every way helpful to those about to sit for the examination. The whole work is an honest attempt to supply what is very much needed especially by students who have to depend largely upon their own efforts. The price is very reasonable.

B.A. Mathematics.

This is another volume of the same series. It contains the questions and solutions from 1881 to 1888. Not only are solutions supplied but references to well known text-books have been given wherever it has seemed likely that they would prove useful. This book will save a good deal of trouble and supply a good deal of very valuable information. We have no doubt it will have a wide circulation.

Model Solutions to B.A. Examination Papers, 1888.

Here in a third volume we have the whole of the papers set at the examination in 1888 and full answers given to them all. The printing and order in which the answers have been arranged are both excellent. The book consists of 166 pages. We need hardly say that it is likely to prove exceedingly useful to those who are preparing for

this examination. No student could lose anything, and most would gain very much by working through the papers and then comparing the answers with those given in this work. It is the first time we have seen so complete a set of answers in so excellent and readable a form.

Longmans' Elementary Science Manuals: Building Construction; Animal Physiology; Chemistry.

These manuals are excellently printed and bound. The paper and illustrations are good. Neither time nor money has been spared in making these books really suitable for their purpose.

The Physiology, a book of 242 pages, is intended as an introduction to the study of the human frame; it contains all the information required for a pass in the elementary stage of the South Kensington Syllabus, though it is not strictly confined to those limits. The author recognizes how necessary it is that the instruction should be as practicable as possible, he has therefore given directions for simple experiments to be performed and easy dissections to be made. This we consider a most important feature of the book. The idea that persons can learn anything of physiology worth knowing without some study of the actual phenomena themselves, is absurd. Indeed one might go further and say that until a pupil has gone through a short course of Chemistry and Physics he should not be allowed to begin Physiology at all. We believe the book before us is one which can be honestly recommended.

The volume on Building Construction contains an unusual number of excellent diagrams. The text is clear, and the directions precise and easily understood.

The Chemistry is got up uniformly with the others. It is not quite so large; but contains a great amount of useful matter upon the new and popular alternative stage of the elementary chemistry.

Owing to pressure on our space, we are unavoidably compelled to hold over 'Science Notes' in addition to several reviews.

Mr. Henry Irving has accepted the dedication of a new Cantata, entitled 'Shakespeare's Merrie Meeting,' written by Robert Ganthony and composed by Thomas Murby. The argument is that Shakespeare summonses, by the aid of the chorus, various characters from his works, who enact scenes, dance minuets at intervals, broken by solos, duets, and choruses.

The University and Civil Service Arithmetical Examiner. By W. S. Beard. London: A. G. Dawson, Ivy Lane. We can offer no greater commendation of this book than by saying that we used it alone in the preparation of the tests in arithmetic in the test paper for pupil teachers which we published in last month's issue of this magazine.

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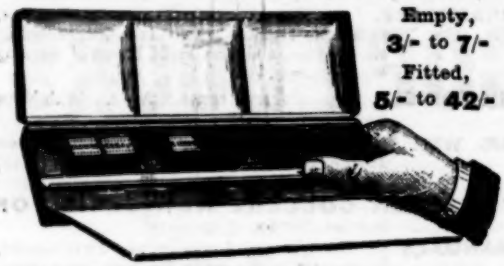

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